Smithsonian

December 1988

All aboard! Model railroading goes full speed ahead (p. 84)

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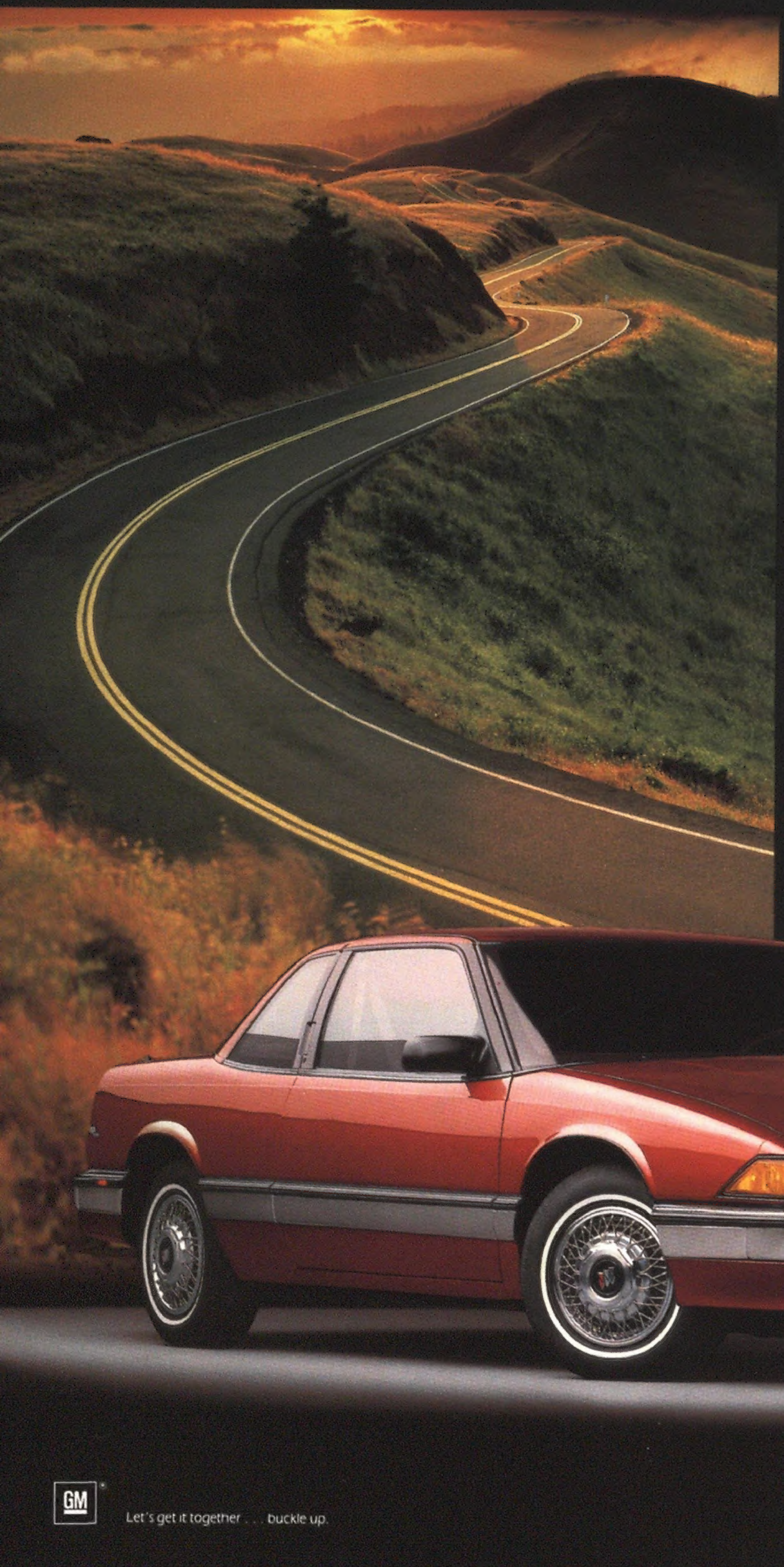

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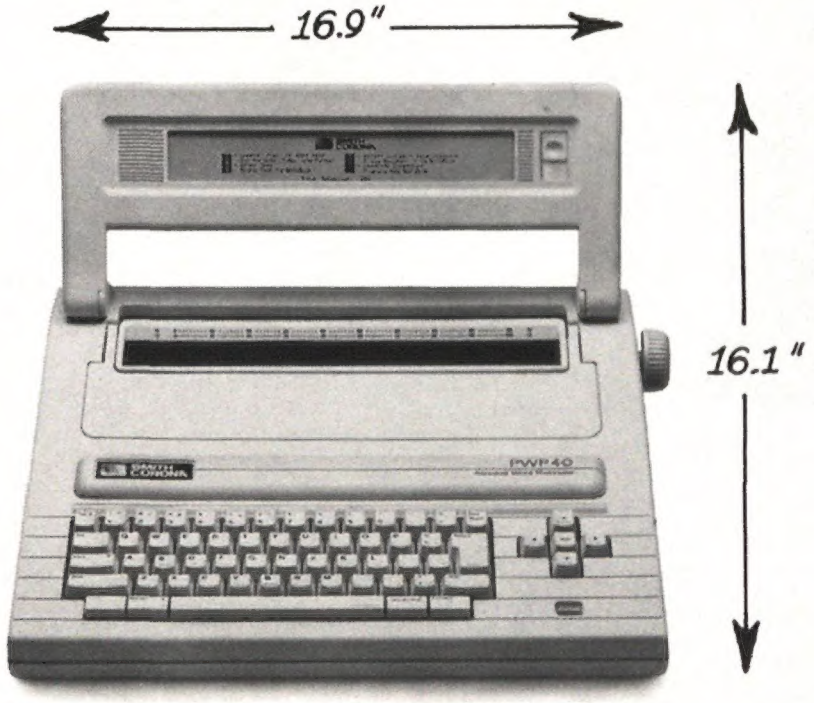

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December 1988

Smithsonian

Volume 19, Number 9

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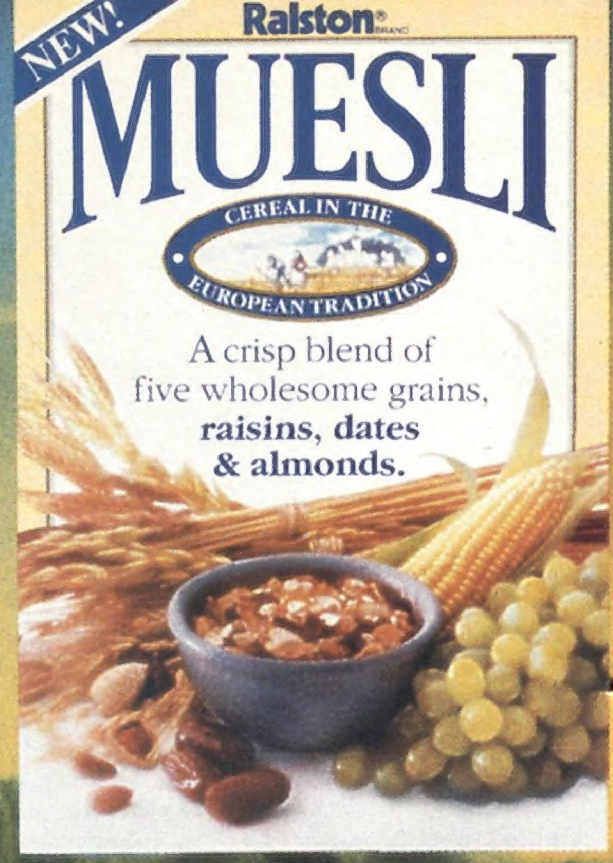

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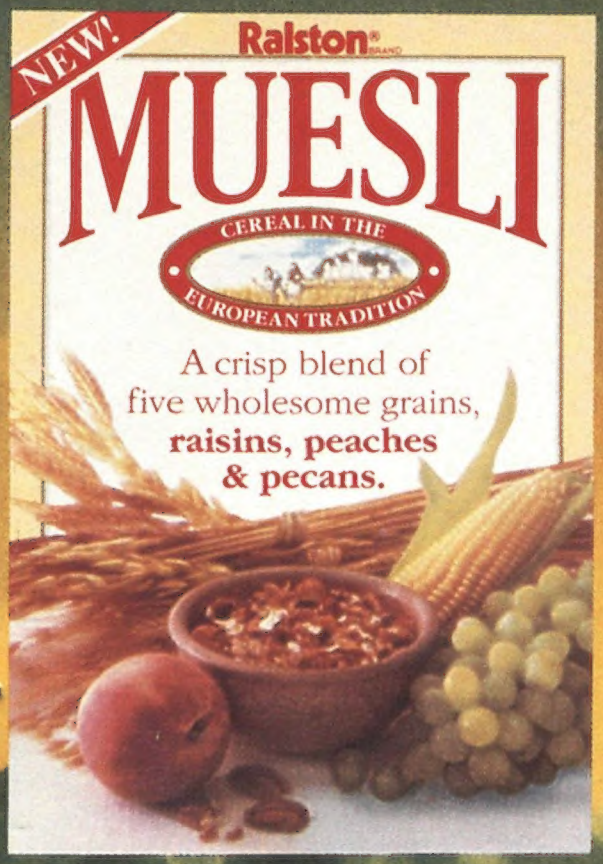

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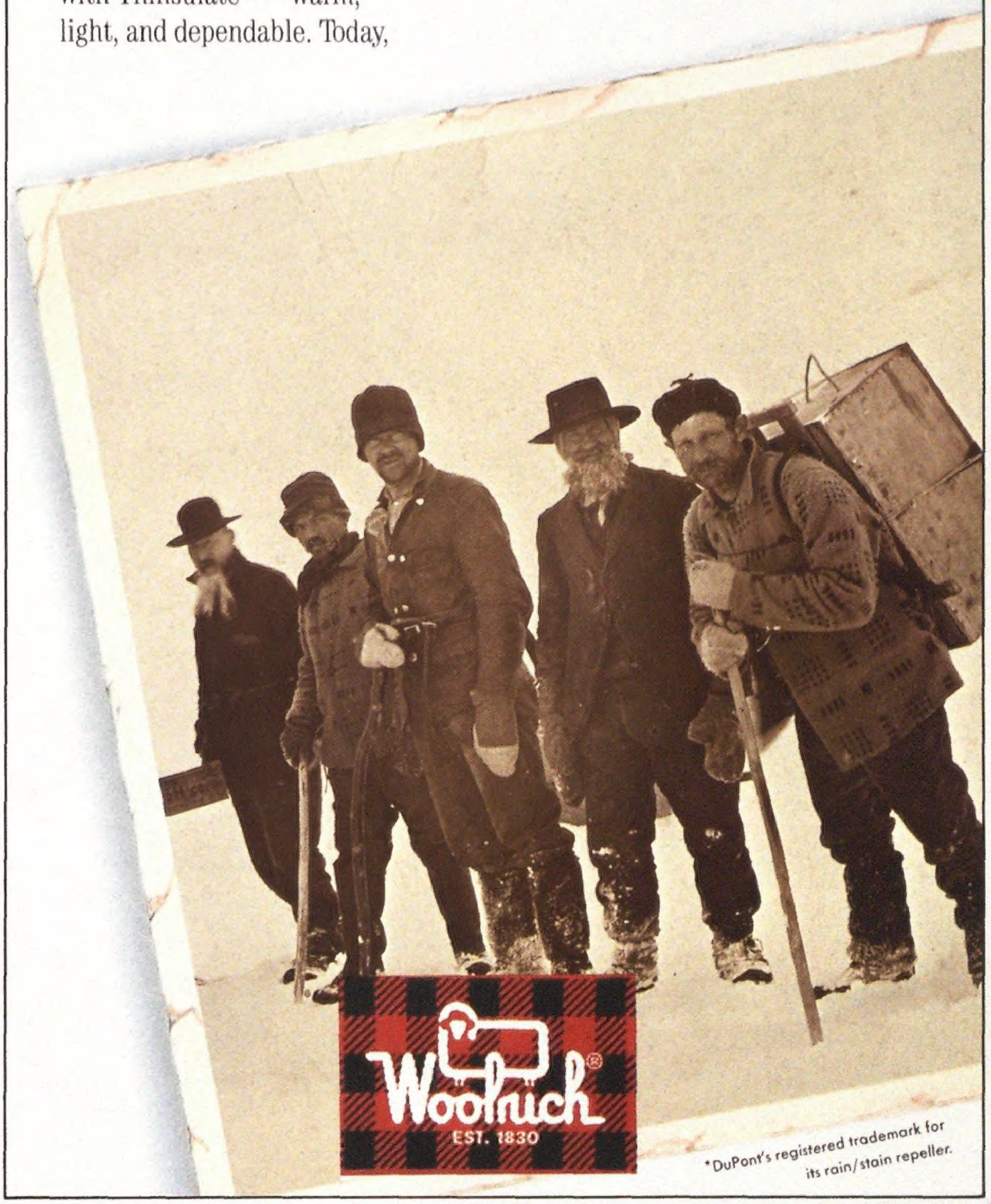

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Secretary Adams' comments

Smithsonian horizons

A recent workshop on cephalopods (octopuses and the like) shows the continuing usefulness of systematics

Perhaps the most long-lasting and fundamental of the research commitments of curators at our National Museum of Natural History is for the systematic identification and classification of animal and plant species in its enormous collections. How and why this is carried out is illustrated by the International Workshop in Systematics and Zoogeography of Cephalopods recently held at the museum. Its title probably does not strike you as having been calculated to arouse enormous public interest, and indeed that never was the intention. Attendance, although drawn from 12 countries, extended over a fortnight of long, daily sessions and was limited to some 35 specialists on squid, octopuses, cuttlefish and chambered nautiluses. Equally daunting to any casual visitor would have been the intensive examinations of thousands of specimens accumulated for the event. But by eliminating duplicate and inadequately supported identifications, the workshop had the vital function of bringing additional order and insight to an insufficiently understood class of mollusks of growing importance.

Progress is sometimes made in reverse. The consensus was that a total of 101 species of common shallow-water octopuses survived this winnowing process —about three-fifths of the number recognized at the workshop's beginning. The research was done on the 7 families having the most species, leaving about 30 families still waiting for such intensive treatment.

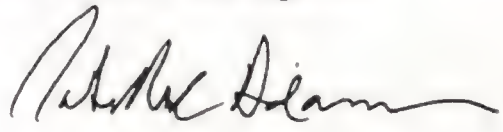
Why are cephalopods important? Partly, just because they are there. To value and seek to understand all life is only human. But they are fascinating creatures in their own right: large, highly evolved, aggressive and fast-swimming, they are near the top of the food pyramid as predatory adults. That means they are also exasperatingly successful at net-avoidance; as one authority ruefully observes, "We catch only the slow, the sick and the stupid." Their complex repertoire of deceptive, goal-directed behavior bears comparison with that of many predatory vertebrates (*Horizons*, October 1986), and encourages experiments on learning, short- and long-term memory, and reactions to rewards and punishments. Yet they are also, at all ages, major prey of fishes like sharks and tuna, of dolphins, toothed whales, seals and seabirds. It is estimated that sperm whales alone annually consume 50 million tons of them in the Southern Hemisphere—equivalent to three-quarters of the world's current annual fisheries production.

Given their highly developed central nervous system, cephalopods are useful in many experimental studies. The squid's giant axon or nerve, largest in diameter in the animal kingdom, is much in demand for neurophysiological studies, including those related to human spinal injuries. They are of great promise as sources for biologically active substances, including antishock, anesthetic and antiparasitic drugs, and powerful toxins. And most of the cephalopods have high nutritional qualities, extremely rapid rates of growth and short life spans, making them attractive subjects for aquaculture (cultivation within artificial enclosures). This possibility looms in importance as the first signs of a depletion of natural stocks are beginning to accompany their heavy exploitation as food in some societies.

Enough said. They are poorly understood, commercially valuable and medically of great interest. What is the special importance of their study by systematists in museums? Solid understanding of species necessarily comes first: What are their ranges of variability, their diagnostic features, their morphology and geographic distribution at different stages of the life cycle? What are their predator-prey and competitor relationships? Without this kind of knowledge, all of our efforts to move ahead in any direction—commercial, neuroscientific, behavioral, medical—are fundamentally compromised. Yet trained personnel and resources for systematics are continuing to dwindle on a worldwide scale. As biologist E. O. Wilson has recently observed, "The community of systematists is sadly inadequate to the immense task before it."

Clyde F. E. Roper, curator in our Department of Invertebrate Zoology and convener of the workshop, started out as a lobsterman at the age of 14 but never looked back when he was introduced to squid in his first year of graduate study. One gathers that he and other participants also shared a gustatory passion for their subject, prepared according to a series of exotic recipes. This was the source of their only miscalculation in expecting privacy. The Washington press corps showed an interest after all, eager to impart to their readers advice on how to avoid overcooking an octopus to make it tender, rather than following the Caribbean practice of beating it with an old Coke bottle.

We salute our media allies for their interest in the "increase and diffusion of knowledge." It is reassuring to know that we are all in this together.



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Letters to the Editor

Smithsonian horizons

Dear Sir: Secretary Adams' observations in your October issue could not have been more on target. We who are deeply concerned about the environment may very well look back someday to 1988 as the year we finally understood the magnitude of the threat to our ecosystem—and started taking the actions necessary to keep it healthy.

Robert W. Kasten jr.
Committee on Appropriations
United States Senate

Crossroads of Continents

Dear Sir: You neglected to give credit to the museum display designers, Robert Staples and Barbara Charles. It is talented people like them who have done so much to make museums exciting, instead of the dull depositories of collections they used to be. Therefore, I feel the designers should be front and center in articles about exhibitions.

Virginia V. Koch
Williamsburg, Virginia

Dear Sir: Margritt A. Engel and I have just translated Dr. Georg Wilhelm Steller's journal for Stanford University Press, and regarding Steller's character, I feel Edwards Park misses the mark.

If Steller were better known, he would be praised for his solitary, outspoken, prophetic cry against virtual enslavement of native peoples. For example, he denounced as "totally unchristian" Bering's conscription of hundreds of Kamchadals and Koryaks and their dogs and sledges for the winter transport of provisions across the Kamchatka Peninsula in 1741. On the other hand, he was

LORD & TAYLOR

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grateful to Bering for support in setting up the first school on Kamchatka for cossack and native children, and for inviting him to go to America as a physician and mineralogist.

In Asia and America, Steller's assumed role was pastoral in the great tradition of the Christian Church. He rebuked the powerful, cared for the poor lost sheep. Historian Gerhard F. Müller, who knew Steller, wrote that survivors of the shipwreck on the uninhabited island where Bering perished "could not lose heart, because they had Steller with them. Steller was a doctor who at the same time ministered to the spirit; he cheered everyone with his lively and agreeable company."

That Bering had Steller when Asia met America is a matter for celebration.

O. W. Frost
Anchorage, Alaska

Henry Mercer

Dear Sir: I was raised in Doylestown, where my father, the late Leigh Mitchell Hodges, was a newspaperman and freelance writer.

He had attended art school, and while it wasn't mentioned in the article, Mr. Mercer also dabbled in art. He and my father frequently took off together with their paints and brushes to enjoy an afternoon of companionship and painting.

Referring to Mercer as "baronial" fits him to a T. He was always perfectly attired, with a small, well-trimmed mustache and ruddy complexion—a gentleman of the old school.

After I was married and living in Ohio, we built a small pool adjacent to our house. Around the edges we placed Mercer tiles—permanently, in cement. We had to leave them there when we moved—what a tragedy!

Mary Leigh Beeson
Asheville, North Carolina

Dear Sir: The courtyard of the castle-like Moravian Tile Works provided a lush, outdoor setting on summer evenings under the stars for an 18th-century English farce, presented by a local theater company.

Oliver Goldsmith's *She Stoops to Conquer* was given ten years ago by the Theatrical Designs Theater of Doylestown, Pennsylvania. What fun we had! We played in the archways lit by lanterns; our dressing rooms were the dusty, musty rooms where tiles had been made. After rehearsals, the cast would explore the museum's narrow passages, view Mercer's vast collection of tools, then climb to the roof to look out over Doylestown.

The following summer, the group staged *A Midsummer Night's Dream* in a valley behind the tile works with Fonthill as a backdrop, looking for all the world like Oberon and Titania's castle. Would Henry Mercer have approved such merriment? I believe so. He was a romantic, and his lovely grounds engendered magic.

Betty Magnusson
Rancho Palos Verdes, California

Quarries

Dear Sir: The ancient Egyptians quarried granite, a much harder stone than limestone, by an interesting and somewhat tortuous method, first using crude, copper tools to make a narrow slit in the

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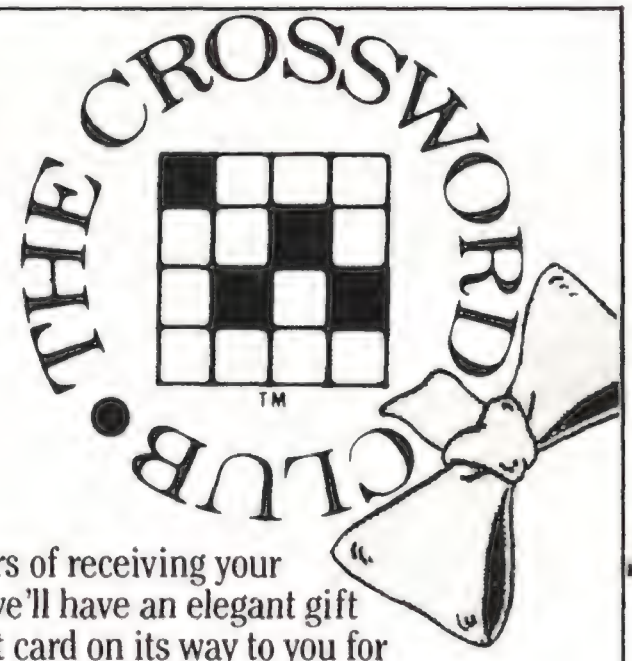

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rock, into which they wedged wood. They then wet the wood, which expanded, exerting a powerful pressure. This process was repeated until the granite split.

Maurice B. Rosalsky
Englewood, New Jersey

Although not the only quarrying method used by the Egyptians, it was one they particularly favored for granite. Ed.

Dear Sir: In the use of granite, Philip Johnson's AT&T Building was preceded by several granite-clad Boston skyscrapers: the Bank of New England, 1969, by Edward L. Barnes with Emery Roth & Sons; the Bank of Boston, 1971, by Campbell, Aldrich, Nulty; and 60 State Street, 1977, by Skidmore, Owings and Merrill.

The resurgence of interest in stone-clad buildings is not without its drawbacks. While traditional stones have great compressive strength, they have little tensile strength. Thin panels, hung as they are on a steel framework that has tensile strength but also has a vastly different coefficient of expansion, have led to problems. Essentially, these panels are only as strong as the system of clips and mastic holding them in place. In the Bank of New England this proved insufficient; the panels had to be re-attached with bolts driven through the faces and countersunk. Thankfully, this is not noticeable at any great distance.

What is all too evident, though, is the overall effect produced in these thin panel structures. Many seem conceived as completely glazed buildings, with an opaque material substituted at the last minute. When parti-color granites are used the result reads as exterior decor and not architecture.

Donald W. Matheson
Newtonville, Massachusetts

Dear Sir: You mention that Stony Creek Quarry supplied granite "for the building of Grand Central Station." The facility in New York is Grand Central *Terminal.*

David P. Morgan
Elm Grove, Wisconsin

Mr. Morgan is correct. The base of Grand Central Terminal is Stony Creek granite, topped by Indiana limestone. Ed.

Political mudslinging

Dear Sir: In Utah's 1924 gubernatorial race, Democrat George H. Dern ran against Republican incumbent Charles R. Mabey with the catchy slogan "We want a Dern good governor, and we don't mean Mabey."

Although a non-Mormon, Dern had been prominent in Utah state politics. He won handily, and in 1933 FDR made him his Secretary of the Army.

Mark Stern
Washington, D.C.

Mice

Dear Sir: SMITHSONIAN brought back fond memories of the late Damian Smith, a monk of the Benedictine order in the best tradition of Gregor Mendel, the father of modern genetics.

Father Damian was a mouse fancier beyond compare and also my high school biology teacher. He had most of the then known varieties of mice: waltzers, rufus, blue, black-eyed whites and champagne. And short-eared and short-tailed brown mice, which were

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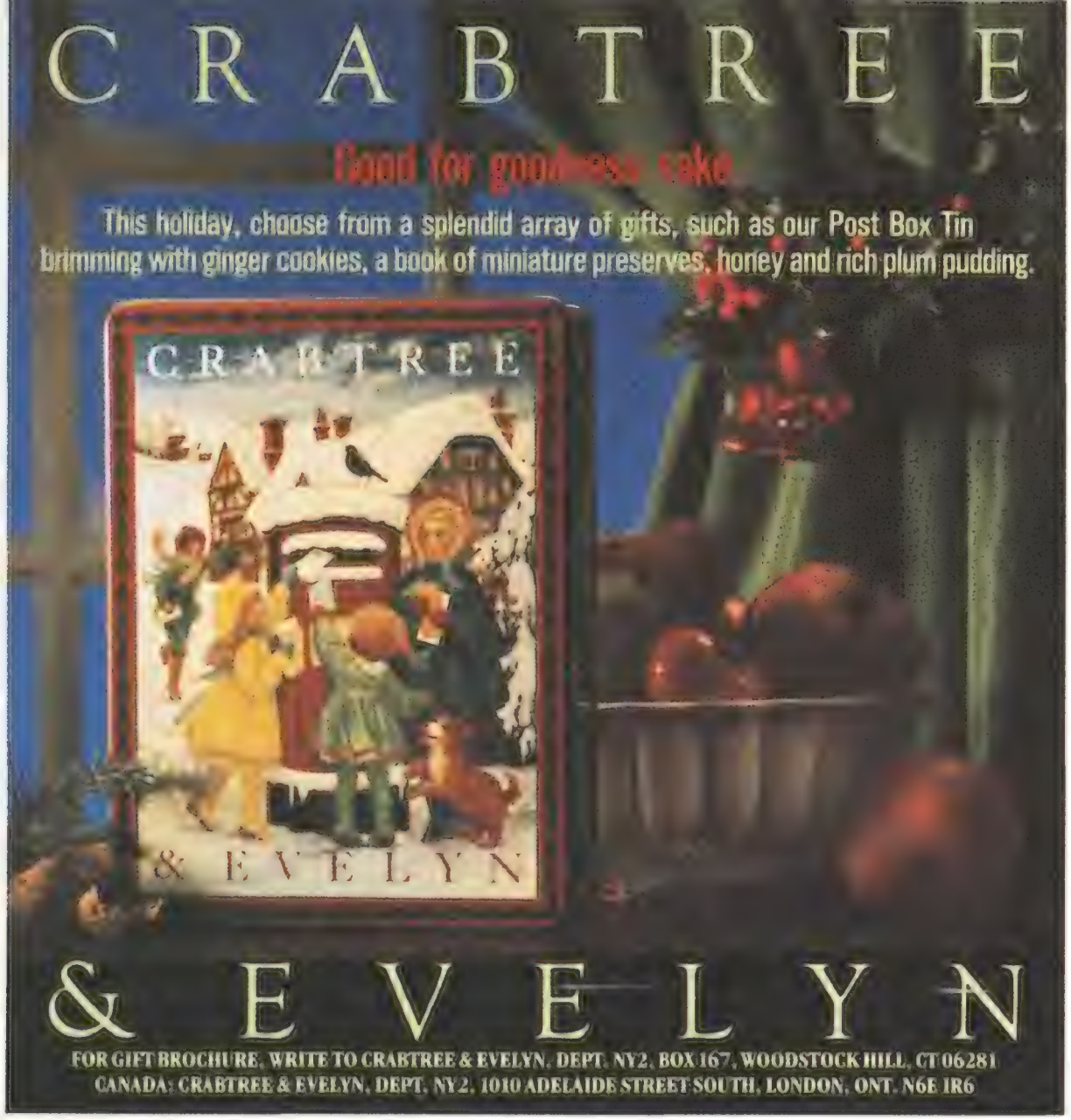
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also short-haired; these looked like miniature beavers. Damian claimed that when there was a cat show there was always a mouse show next door.

My spouse and I carry trash by station wagon to a mile-away dumpster. Unknown to me, a mouse had found its way into one of the plastic bags and then got loose in the car. Next evening we had hamburgers, fries and milk shakes en route to a movie. A paper napkin with meat bits and gravy on it fell onto the gearshift panel between the bucket seats. To our delight, a tiny mouse (one inch long) joined our feast and relished its small portion. We enjoyed the company and watched as it washed its face after finishing.

Franklin J. Tobey
Purcellville, Virginia

Munich

Dear Sir: Not all of those who greeted Neville Chamberlain upon his triumphal return from Munich in the autumn of 1938 were applauding. Some among the crowd in front of No. 10 Downing Street, one of whom was my cousin, were chanting "Down the drain with Chamberlain."

Michael S. Friend
East Alton, Illinois

Dear Sir: Otto Friedrich's article failed to mention Czechoslovakia's 525,000 Ukrainian citizens, who lived in a compact ethnic territory at the extreme eastern tip of that state. On March 15, 1939, during the Nazi seizure of Czechoslovakia, they took the opportunity to declare Carpatho-Ukrainian independence. Subsequently, those brave people were the first to rise in organized, armed resistance against the combined Nazi and Hungarian political and military intervention into their newly created Carpatho-Ukrainian Republic.

Petro Matiaszek
The Ukrainian Quarterly
New York City

Punctuation

Dear Sir: I wanted to be among the first couple of hundred fans of archie and mehitabel to remind you of "CAPITALS AT LAST":

I THOUGHT THAT SOME HISTORIC DAY
SHIFT KEYS WOULD LOCK IN SUCH A WAY
THAT MY POETIC FEET WOULD FALL
UPON EACH CLICKING CAPITAL
AND NOW FROM KEY TO KEY I CLIMB

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THAT TO A COCKROACH MAY BEFALL
INDEED IF I COULD NOT HAVE HAD
SUCH OCCUPATION I'D BE MAD
AH FOR A SOUL LIKE MINE TO DWELL
WITHIN A COCKROACH THAT IS HELL
TO SCURRY FROM THE PLAYFUL CAT
TO DODGE THE INSECT EATING RAT
THE HUNGRY SPIDER TO EVADE
THE MOUSE THAT %)?))"""$$$((gee boss what a jolt that cat mehitabel made a jump for me
i got away but she unlocked the shift key

Rex Malcolm
Woodland Hills, California

Rather than being among the "first couple of hundred" to send us "CAPITALS AT LAST," *Mr. Malcolm is the one and only; at any rate, our thanks.* Ed.

Dear Sir: One punctuation mark that fills a need, and that I have seen mentioned only in a typographer's newsletter, is the interrabang.

Yes, the interrabang.

Some time ago, in an article by Alan Haley, the newsletter cited the "first new punctuation mark to be added to our alphabet in hundreds of years, and the first punctuation mark created by an American": the interrabang [below].

It was designed for the new Americana typeface, by Richard Isbell in 1967, from a concept by Martin Speckter, who thought writers should have a punctuation symbol that would enable a question mark and exclamation point to serve a single sentence.

A major obstacle to its coming into common usage when it was created was the difficulty of incorporating it into standard casting matrices. But now it can be reproduced readily in photo and digital CRT type fonts. All that awaits is consumer demand.

How about it?

Virginia I. Harvey
Freeland, Washington

Dear Sir: Lionel Casson's article reminded me of the story of an expert on ancient languages who was asked to fly to New Mexico in order to examine some puzzling hieroglyphics engraved on an upright stone slab with an ancient metal ring embedded in the center:

TI EYO URM
UL EHE RE

After puzzling over the carvings for a number of days, the professor suddenly slapped his thigh and triumphantly shouted: "I've got it!"

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Kenneth Lloyd Larson
Los Angeles

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Around the Mall and beyond

Last June, this column took a somewhat hesitant journalistic step by describing an event in forensic medicine. Breathing deeply and gritting my teeth, I attended the opening of a mysterious iron coffin that had been discovered some years before in a Louisiana family burial ground. By the time I had watched the procedure and written about it, I was in thrall to this science that determines what went on in the past by examining minutely what remains in the present.

The June column noted that "John Doe" (later called "Coffin Man") would undergo a facial reconstruction to give an idea of how he once looked. Douglas Owsley, a forensic anthropologist at the Museum of Natural History, has now supplied us with the results of two reconstructions, a sketch and a sculpture, which appear on page 33.

For the sketch, Doug Owsley's forensic partner at the Smithsonian, Douglas Ubelaker, worked closely with Horace Heafner, unit chief of the FBI's Special Project Section. Heafner is an artist—the kind that puts together those composite sketches of wanted criminals.

"He worked with a photograph of the skull," Owsley told me. "Then he added flesh and hair and age, according to information Doug Ubelaker was able to provide after studying an FBI catalog of facial characteristics. He did two versions, with and without a mustache. We don't think Coffin Man wore a mustache because we found no sign of mustache hair, and there was a lot of well-preserved hair lying around, remember?"

I certainly did.

"But we don't know for sure, so we tried both ways."

"How did you come up with that hairstyle?" I asked.

"It's OK for the period. We'd thought the man died maybe as early as 1856, but then later we got a firm date on the coffin."

I looked up questioningly. Owsley led me into an adjoining office dominated by a familiar sight—the old, iron coffin that I had learned to confront without a qualm six months ago. This time, I'm happy to say, it was empty.

"We turned the problem of dates over to Melissa Williams in Chicago," Owsley explained, adding that she is a historical researcher and writer for the undertaker's profession. "She's a real expert on 'metallic burial cases,' as they were called, and she told us that this baby [he patted the rusted hulk lovingly] was made by a Cincinnati firm called Crain, Breed and Company. They had a showroom in New Orleans, where this Louisiana plantation family would have shopped. It was open from 1866 to 1869. So, thanks to Melissa, we have our time span."

That time frame was close to the dating that Coffin Man's clothing provided soon after our experts from the Museum of American History looked him over. The man was wearing a black, two-piece wool suit—frock coat and trousers, but no vest. Shelly Foote of the Division of Costume notes in a memo to Owsley ("Subject: Gentleman from Louisiana") that the suit is "less formal than a cutaway," and probably would have been worn for going to the office or to church. "It is both machine sewn (structural seams) and hand sewn (buttonholes, easing in lining, etc.). The trousers have a fly. I am surprised there was no vest. . . ." She puts the date at between 1850 and 1870, most likely between 1855 and 1865. The man's bow tie intrigued all who saw it, for it was in good shape, all in one piece, the knot intact. Because it is a relatively narrow tie, Foote dates it from 1857 to 1870. Earlier, it would have been wider. The gloves—white silk knit with elastic at the wrists—inspired some detective work which disclosed that silk gloves were advertised by the S. N. Moody Store for men in New Orleans in 1860 and that elastic was around as early as 1850.

"All in all," says Foote in her memo, "it appears likely that this man's clothes date from the 1860s, most likely from 1860-1865. However, if you find that

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Sculpted likeness of Coffin Man, by anthropology student Sharon Long, closely resembles the composite sketch by FBI artist Horace Heafner.

this was an older gentleman, we would have to extend the date [of his death] to a little later since older people quite often wore conservative styles."

The thickness of the heels of his shoes dates to the late 1860s, which fits the time frame Williams had given for the coffin. The shoes had black wool uppers, leather soles and laces. But because they were hardly worn and because the cloth construction would have been easier to put on in death, the scientists speculate that they were purchased for his funeral.

"There's also the fact that the years 1861 to 1865 were Civil War years, when few new goods reached stores in the South," said Owsley. "The war would also explain why the records on this man's burial were mistaken, misplaced or confused."

"What about the man's age?" I asked.

"Fifty," said Owsley. "I'll explain in a moment. First look at this."

He carefully opened a large wooden box. Inside was the head and shoulders of a man. He was fashioned in clay and painted—a strong, not unpleasant face with rather narrowed eyes and muscular cheeks. He wore an old-fashioned white cotton shirt with a black silk bow tie. His brown hair was brushed back from the brow and dropped down his cheeks in neat sideburns. He had no mustache.

I looked long at the sculpture, trying to sense in it the distant mark of life. No use. It was just a clay bust. Yet it certainly indicated a person who could have lived and breathed and prospered in the deep South, and died well enough respected to rate an expensive coffin. The going price for a Crain, Breed Metallic Burial Case was about $75—a lot of money, especially right after the Civil War.

This extraordinary sculpture was done by Sharon Long, an artist who is studying anthropology at the University of Wyoming. I called her up to learn how in the world she did this from the cast of a pretty badly weatherworn skull. I learned that she used a forensic system of marking the skull at certain specified places with small, round guideposts. "We use the white erasers that you use for mechanical drawing," she told me. "I cut them at the correct lengths, then glued them on the cast with modeling cement. I used 21 markers—the usual number for a skull."

Long measured her erasers to the exact thickness of tissue at each of those 21 anatomical points. That thickness is the average of what has been determined over the years for—in this case—a normally built male of 50. With her markers firmly in place, Long needed only to pad the skull exactly to the top of each one and then sculpt the whole to make a head. She said she added age "after studying hundreds of photographs and by just taking a good look at a lot of people I know who are in that bracket." She copied their lines, squints and

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furrows—the weathering of half a century or so—and used her artistic license. Unknowingly, she modeled much the same hairstyle as in the sketch. But she added sideburns, stylish at the time.

"I've done 16 heads," Long told me, "but this is the first time I've done clay hair. I thought it looked pretty good."

So did I. But I still was puzzled about the age. How did the forensic doctors settle on 50?

"Well," said Owsley, "first we examined the skeleton for characteristics that change with advancing age, and then we studied the map and list of family members buried in the cemetery, and this made us wonder if his burial site had been incorrectly recorded. The family, in the stress of recovering from the Civil War, may have simply made a mistake. This realization allowed us to reconsider just who all the occupants of the graveyard were, and by going over the burial ground records, we came up with three possible men. Number One died too late for our time slot. Number Two died too early for one of these coffins. Number Three married into the family and died in 1867. We believe he's the one, but—probably thanks to the Civil War—we can't find death or probate records to prove it."

"Do you know his name?"

"We think it's Edmond Badger. Born in 1817. Married a daughter of the family named Mary Dortch. We still don't know the cause of death. As you remember, Noreen Tuross, of Smithsonian's Conservation Analytical Laboratory, hopes to have something for us very soon."

I recalled that Tuross is the biochemist who was analyzing the man's bone tissue to check for antibodies to the diseases that might have afflicted him. As soon as she uncovers Mr. Badger's medical history, the cause of his death may emerge. Nothing indicates violence. "And there's no sign of mercury or arsenic," says Owsley.

What these forensic detectives now want, more than anything, is for someone to discover, in an attic perhaps, a portrait of Edmond Badger of East Baton Rouge Parish, Louisiana; born 1817, died 1867. Only then can we all see how close the two reproductions of his face have come to the truth. "Please put that in if you write this up," Doug Owsley said.

So I have.

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Phenomena, comment and notes

The more you think about it, the more difficult it is to plunge recklessly ahead and boil a pot of water for tea

Back in the bad old days, before the battle of the sexes had come to such a harmonious conclusion, certain taunts exemplified pride in gender-based abilities. Female persons were wont to tell male persons that their uselessness in the kitchen was near total: "You can't even boil water." Ridiculous, of course. Anyone who understands throw weights, stellar collapse and wild-card playoff berths can almost certainly boil water. The real issue runs deeper. There is more to boiling water than pouring some in a pot, putting it on the stove, turning on the heat and waiting for bubbles to appear mysteriously in the depths, careen dizzily to the surface and there silently explode into the steam that makes a kitchen alive. Female persons used to do that all the time, without a second thought. But it is the thought that counts. The decision to boil water raises questions that go to the core of style, of human expression, of who and what we really are.

Let's say we have been out shopping; we're tired, and a cup of tea seems just the thing. It is a simple matter to walk into the kitchen, step to the sink, turn on the tap. There is a high probability, as a scientist might say, that water will emerge. Just plain water. No French bubbles. No "natural" lime flavor. Just water. Merely a simple combination of the primordial stuff of the Universe (hydrogen) and a hyperactive refinement (oxygen) formed deep within a star and then flung out into space for the benefit of the next generation. What do the sociobiologists have to say about stellar altruism? (Waiter: "Would anyone care for something from the bar?" Patron: "Not for me, thanks. Just bring me something from an exploded star.")

Some of the liquid coming out of the tap, as befits its cosmic origins, is very old—water that first reached the surface of the Earth eons ago in a rain of comets or the outgassing of primordial volcanoes. Since then it might have spent a million years here, a million there: percolating through the ground until it gushed forth in a spring; moving with a cold current, deep in the ocean. More recently it has evaporated from the surfaces of oceans only to fall as rain over land, been breathed out by a tree and then rained down again to be drunk by a swallow on the wing. It has been vapor in the tropics and a rigid lattice in the Arctic. Now it has fallen as rain in

the watershed of a river and been diverted into the apparatus of a municipal waterworks.

But suppose we stop to think about what else will come out of the tap. Will we get pure, life-sustaining liquid—or a thin feedstock for a petrochemical plant? Undeniably, there is water coming out of that tap. And some air dissolved in the water. And the dissolved minerals that give it flavor. (Do you prefer your water, like your scrambled eggs, hard or soft?) To make sure nothing unpleasant will happen to us when we drink it, that water also includes the chlorine that killed the germs. (Pour a little directly into the aquarium and the fish will die. But not to worry.)

So far, so good. We could be in grandmother's kitchen. This is a more complex age, however, and the list of what could be in the water is long. Nitrates, pesticides and herbicides from farm fields. Nitric and sulfuric acids, raining down from the sky or trickling out of the hills where coal was strip-mined. The industrial compounds put to work since World War II: polychlorinated biphenyls (PCBs) come to mind. So do dioxins: these Cadillacs of toxins are found in the atmosphere everywhere around the globe, so it seems reasonable to expect they are in the water, too. Where did I read that many water departments still test only for those pollutants known and feared in the 1890s?

Well, look, it's only a cup of tea. Nothing to get all worked up about. Let's plunge ahead and actually run some water into a pot. A quart, say. That does not seem much at all—until we think about it. A quart of water weighs roughly two pounds or, in the units that are used all over the world (except, of course, in Burma, Liberia and the United States), about 900 grams. This is about 50 times the weight of one mole of water. ("Mole" is a chemist's term for a large quantity of atoms or molecules; it is a useful way to deal with large numbers, as is "light year" for astronomers.) Multiplying the number of molecules in one mole of water (Avogadro's number) by 50, we come up with 30,114,800,000,000,000,000,000,000 molecules in our pot, all held together in the delicate embrace of hydrogen bonds. We are going to use heat to agitate these molecules violently enough to break uncounted millions of those bonds. If T. S. Eliot had J. Alfred Prufrock hesitate to eat a peach, shall we lightly tear asunder this many joinings, formed by laws of nature old before the Earth was born? Should we not at least think about it first?

We can't stand here in the kitchen all night. If we are going to do it, we need something to do it in. Shall we use this everyday pot—and run the risk of aluminum atoms clustering like grapes in our neuronal junctions, possibly leaving us with the horror of Alzheimer's? What, then? Good German iron? Glazed French clay, leaching lethal metals into the tea water? The sterility of glass? Man does not live by water alone, of course. What are the esthetics here? With the material chosen, or settled for, what of the design of our pot? The shape of tomorrow from a fevered mind in Milan? Or perhaps a pot of the ages, a form familiar in peasant cottages for a

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thousand years? As the Count de Buffon might have said, "The style is the male person himself."

Tea is a contemplative drink, and there are the questions of society at large and the future of our species to consider. Do we have the unbridled audacity to heat on an electric range? If those generators are turned with the steam from nuclear fires (now *there* are people who *really* boil some water), should we mail a check for our share in the cost of the future decommissioning of that plant, covering it in concrete and guarding it for 25,000 years from our curious descendants, if any? If by coal or oil, do we have a clear picture of exactly whose air and water we will poison to brew our tea? Or do we have the laboratory efficiency of natural gas, the bright blue flame of life long past? Shall we return to our lost Eden, using wood the way our people have always done? Sustain ourselves with broken bits of the living Gaia? We must always be wary of culture clash: Is it politically correct to heat a red-enameled Italian pot over mesquite charcoal?

It is nearly time now. Ignore the impatient calls from the living room (what can she mean, "dithering"?). We must resolve the question of speed. Do we go for the quick, unexamined boil or the teasing, sensuous rise to the magic temperature that prolongs pleasure, satisfies some unarticulated yearning in the soul? Great chefs will argue about whether meat should be cooked fast or slow; should not the same question arise in regard to water, far more fundamental to our very existence? Do we know how long it takes to boil the deadly chlorine out of city water? Or how long we can heat noncarbonated bottled water before we have driven off all the dissolved air and made it flat? Must we, as always, compromise? Do we join the self-torture of the high school physicist about whether cold water will come to a boil faster than warm?

It all seems too much for tired shoppers. Paralyzed, we stand in the kitchen, chilled, peckish, the weight of the world on our shoulders. China gleams, tea in its canister offers equatorial sun. The promise of soothing warmth. A hand reaches for the kettle . . . and stops in freeze-frame. The taunts of female persons come true. We cannot do it. It is not a question of somehow using up a limited resource. Just as would happen on any other well-run spaceship, the water we chose to boil would be recycled. Some would escape as steam to humidify the air in a winter house, to be breathed in and out until finally it is exhaled outside and escapes back to the sky to rain again on some other continent. The part we actually drink would also be recycled, although at somewhat higher expense to society. It, too, would eventually return to the ocean, to the sky, to another river so that someone else—next week or next millennium—could pour it into a pot and brew up some tea.

No, we cannot do it because too much is at stake here. In these troubled times, when death lurks in the very air we breathe and in the water we drink, when the fate of the planet hangs on our smallest actions, to boil a quart of water for tea would be going too far.

John P. Wiley jr.

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For centuries this coiling road through the Khyber Pass has linked Europe and Central Asia to Hindustan.

By Rob Schultheis

Honor rules the Khyber Pass where worlds from East and West collide

Though traffic has been cut back because of war, fresh fruit like grapes and melons arrives from Afghanistan.

Things never change on this historic frontier; empires are split, hostile invaders repelled and law is laid down by local Pathan tribesmen

Since time immemorial the Khyber Pass has been one of the most strategic snippets of real estate on the face of the Earth. Less than 30 miles long, barely 15 yards wide at its narrowest point, it breaches the impassable peaks south of the Hindu Kush, the last great barrier between the high, dry mountains and plateaus of Central Asia, and the rich, riverine lowlands of India. It is an open, surprisingly easy door; the summit of the pass is only 3,500 feet above sea level and there is water much of the way.

Over the centuries the Khyber has drawn wave after wave of eastbound invaders and travelers: Persians, Alexander the Great's Greeks, Arabs (the Khyber was, according to one account, named centuries ago after another mountain pass in Arabia) and Afghans, led by empire builders like Babur and Mahmud of Ghazna. Others, like the Sikhs and British in the 19th century, have tried to force the Khyber east to west but with little success. Though likely a misinterpretation of the original name, "Hindu Kush" means "Hindu Killer," and whether it refers to death by bullet, sword, blizzard or avalanche, the message behind the meaning seems clear: Hindustan, India, stops here.

Invaders have never been welcome

The Khyber's topography may be comparatively inviting, but its people are something else indeed. Fiercely independent, contrary Pathan tribesman have fought every king and conqueror who has come their way. To keep the pass open, invaders have had to battle, bribe or negotiate, or all three, and even the cleverest and most brutal have never been able to keep peace on the Khyber for long. In 1672, when the Mogul empire was at its peak, the Khyber tribes revolted and effectively cut it in half. The Mogul emperor Aurangzeb sent an army of 40,000 men to subdue the rebels, but the Pathans trapped and virtually annihilated the invading force; it is said only five members of the Mogul army survived.

When the Khyber tribes aren't uniting to harass or repulse invaders, they are generally fighting one another. There are many kinds of Pathans (a British corruption of the local name Pukhtun) in the Khyber region—Mohmands, Afridis, Safis, Shinwaris and so on—and feuding is one of their major occupations. To make things more complex, these tribes are divided into smaller subgroups, which are themselves almost perpetually at war, either against one another or among themselves in family-versus-family warfare that can go on for generations, centuries.

The eccentric British explorer, sometime vagrant and occasional semiprofessional spy Charles Masson walked across the Khyber in 1826-27 and commented wryly on the Pathans' penchant for fractiousness bor-

Photographs by Ed Grazda

The Bab-i-Khyber ("Gate to Khyber"), built in 1963 as the official entrance to the pass, is commemorative. It marked the tribal area boundary until smuggling and war shifted the line several miles toward Peshawar.

dering on unbridled anarchy: "The Khaibaris, like other rude Afghan tribes, have their maliks, or chiefs, but the authority of these is very limited, and as every individual has a voice on public affairs, it is impossible to describe the confusion that exists among them." Masson had plenty of firsthand evidence to back up his statement. During his Khyber journey, he doctored no fewer than four victims of sword wounds suffered in tribal feuds; encountered "two men of the wildest appearance," armed with flintlocks and searching for enemy tribesmen who had raided their village the night before; and, finally, was robbed by two Shinwari highwaymen near the summit of the pass.

Things haven't changed much today, if they have changed at all. Earlier this year, while photographer Ed Grazda and I wait in Peshawar for the government of Pakistan to give us a permit to cross the Khyber, the local newspapers are full of tales of trouble up there, tales that could easily be 100 or 300 or 1,000 years old. Three Afridi tribes dominate the western side of the pass. It seems that one of them, the Zakakhels, who incidentally are supposed to be the most ferocious, are feuding among themselves over a proposed road the Pakistani government wants to build through the Tirah Valley, just south of the pass. The tribe recently held a *jirgah*, a meeting, to try to resolve the issue peacefully, but, as often happens on the Khyber, the peacemaking effort ended in violence. The antiroad group reportedly opened fire on the proroad faction; in the ensuing battle two tribesmen were killed.

Now, as Grazda and I wait for our permit, the whole western side of the Khyber is simmering, on the verge of a major tribal war. In 1897, when the Zakakhels fought the British to a virtual stalemate on the pass, the

Rob Schultheis of Telluride, Colorado, has written a screenplay, The Last Tribe, *set in Afghanistan. He covers that region for television and newspapers.*

tribe had approximately 4,500 fighting men, armed with swords, spears, muzzle-loading jezails and carbines. Today, the Zakakhels can still put at least that many men in the field, armed with assault rifles, heavy machine guns, even artillery and surface-to-surface missiles. The Pakistani government is in a delicate position: like their British colonial predecessors, they govern the Khyber with a canny mixture of negotiation, persuasion, baksheesh and even an occasional show of force. With a hostile regime across the border in Soviet-occupied Afghanistan, they are reluctant to intervene directly, militarily, and alienate the border tribespeople in the process.

The Khyber people are congenial hosts

Still the situation isn't so dangerous that Grazda and I consider calling off our trip. The Khyber people may be bellicose, but they are also generally hospitable, friendly to strangers. On Masson's Khyber crossing almost everyone he met treated him with exceptional kindness. One group of villagers fed him wheat cakes and milk, shared their hubble-bubble pipe and then gave him a bed to sleep in—a singular honor, as there were only three beds in town. Even the robbery was a relatively mild affair: the thieves missed Masson's cache of copper coins, cleverly concealed in the bottom of a jug of water, and his Pathan guide heaped abuse on the miscreants, berating them for their shamefully inhospitable behavior.

This traditional friendliness is still alive today among the Khyber Pathans. I remember observing an extreme instance of it during my first visit in 1972. Tens of thousands of young Westerners crossed the Khyber every year back then, on their way overland from Europe to India and Nepal. The bus I was riding from Kabul to Peshawar was crowded with these low-budget wanderers; among them was a conspicuously fey, dreamy young English couple. When the bus stopped at a teahouse in Landi Kotal, near the top of the pass, the two Britons found themselves sharing a table with a bearded Pathan ancient. They bought an extra pot of tea for him and traded smiles. When we reboarded the bus, the old man ordered a pair of tough-looking young Pathans to accompany the couple. Pakistan was going through a period of political and social unrest back then, and eastward-bound wanderers were often the target of random assaults and hostility.

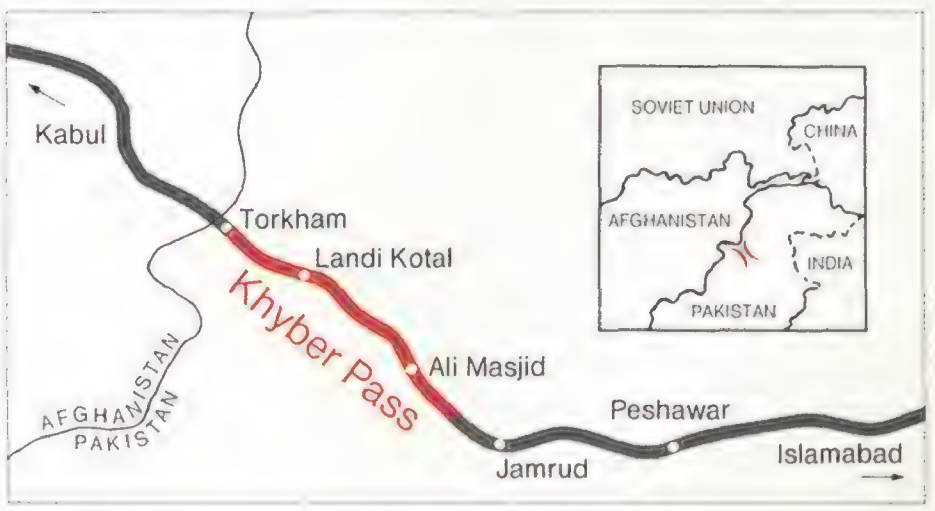
The two Pathans proved to be marvelous guardians, the British couple told me when I ran into them in Delhi later. In Rawalpindi, a xenophobic mob locked them out of their train to Lahore. The Pathans, acting with typical boldness, climbed in a window, drew pistols on the crowd and told them to vanish. They did. The couple and their escorts had the entire railway car to themselves. The Pathans came through again when a gang of lecherous youths forced their way into the couple's hotel room and refused to leave; the two young tribesmen came in from the adjoining room and looked the intruders over with their flint-hard eyes; an instant later a half-dozen delinquents were trying to exit the narrow door simultaneously. The Pathans kept a close watch over the couple till they safely reached the Indian border.

The morning our Khyber permit finally comes through, there is a disquieting item in a local paper. Someone fired rockets at the Jamrud police post last night. Jamrud just happens to be the first stop on the road across the Khyber; in fact, it is less than 15 minutes from the house where I am staying in Peshawar. Fortunately, no one was hurt in the rocket attack, but it may be a portent of more violence to come.

But we haven't waited eight days for our permit to turn back now. Besides, if things were really dangerous, the Pakistanis would declare the Khyber off-limits to foreigners until relative calm was restored. They have done that several times in recent years.

We collect our car and our driver, the indispensable Gujar, a rotund, jolly, Friar Tuck of a man, who runs the taxi franchise at Deans Hotel. He is an institution in Peshawar; he knows everyone and everything, and countless journalists have depended on him. I have spent hundreds, maybe thousands of hours with him over the past four years, working on various assignments: prowling the narrow streets of the Old City, remote refugee camps, the tribal area. He is an ideal companion for a Khyber crossing.

We pick up our permit at the Press Information Office. It is a large, impressive-looking document, loaded with the usual minatory inscriptions. Two items warn us "to contact the P.A. [Political Agent] Khyber



The Khyber Pass, a strategic 30-mile length of road (indicated in red), has divided the region and its peoples since ancient times. Schultheis and Grazda went there earlier this year and found little change.

Honor rules the Khyber Pass

Pathan tribesman strolls through Jamrud bazaar; machine guns, bullets and stolen passports are sold.

before departure" and request that we make "necessary security arrangements." At the P.A.'s headquarters, Grazda and I push our way through the crowded compound, a scene that is pure Kipling. Scores of tribal chiefs and elders, Zakakhels, Kukikhels, Malikdinkhels, Shinwaris, are waiting to discuss business with the government of Pakistan. They are a spectacular lot: tall men (one fellow is at least six feet four and several easily top six feet), ramrod-straight, with penetrating, though not unfriendly, eyes. There are grand beards, some jet black, some pure white, a few dyed blazing orange with henna. The one thing they all share is an air of immense dignity, of unshakable self-confidence. During the raj, the British never looked on the Pathans as anything but equals—foes, frequently, but worthy, honorable ones.

The British often found themselves negotiating with Pathan chiefs, just as the Pakistani government does today. There is a funny story told in Peshawar about Sir Harold Deane, first Chief Commissioner of the North-West Frontier Province. Deane used to invite refractory tribal headmen down to Peshawar to palaver, and he would invariably greet his guest by giving him a lovely pair of expensive shoes. Delighted and anxious to show his appreciation, the Pathan would don his new footwear. Deane would then suggest a stroll in the garden to talk over whatever problems were outstanding between the Queen's representatives and the visitor's tribe. After a few steps, the Pathan discovered that the shoes were two or three sizes too small, as the wily Deane had known all along. Wincing, trying to retain his dignified bearing, the unfortunate chief would follow Deane round the garden. Politeness, as well as Pathan machismo, forbade any admission that the shoes were torturing their new owner. On they would go, Deane pressing the British point of view cordially but firmly, till the chief, unable to stand another lap in those infernal brogues, would agree to a compromise with the Crown.

Dashing Khyber Rifles preserve the peace

Mixed among the tribesmen in the headquarters courtyard are a few Khyber Rifles: these are the troops, recruited from the Khyber tribes themselves, responsible for keeping a modicum of peace on the pass. They are handsome soldiers, combining the dashing élan of the Pathans with the British-style spit and polish of the Pakistani Army. Grazda and I find the Political Agent's chief factotum and show him our paper. He leads us back to the courtyard, picks out a young Khyber Rifleman and tells him to accompany us on our journey. The youthful soldier grins and his fellow soldiers aim a few gibes his way. Evidently, escorting foreign visitors over the Khyber is consid-

A stall in a "drug supermarket" sells opium balls and hashish, offered openly and legally in the tribal area.

Illegally imported refrigerators, supposedly destined for Afghanistan, are for sale at the Jamrud bazaar.

ered unworthy, at best easy duty even in times of unrest.

Gujar at the wheel, Grazda in front, Khyber Rifle (armed with an old carbine) and I in back, we speed out the Khyber Road heading west through some of the worst traffic in the world. Bulging buses, gaudily painted trucks, whole families balanced like circus performers on motorcycles, battered sedans, horsecarts, even water buffalo and camels, all joust and jostle together recklessly, with no regard for life, limb or law.

Pathan life is governed by a code of behavior called Pukhtunwali that encompasses both the bellicosity and the kindness and hospitality Masson and countless others have remarked upon. Pukhtunwali's driving force is *nang*, honor, and the honorable Pathan man is a bundle of charming, maddening contradictions. He protects the weak and defenseless, he welcomes strangers, and his word is as good as gold; he is also possessed of lunatic pride, a hair-trigger temper and no sense of compromise at all.

This, along with the Pathan addiction to risk, makes the drive a nerve-racking experience. Big vehicles muscle smaller ones off the road, just to assert their physical superiority. Bus drivers from rival firms engage in mad, careening races for miles, rather than slow down and lose face.

We are still in the outskirts of Peshawar when we come upon the first evidence of the Khyber's informal sovereignty. Stalls—tiny wooden cubicles barely larger than an American phone booth—line the roadway; in each one, a man sits, surrounded by packets and great naked blocks of hashish as well as neatly rolled balls of opium. A scale is ready to insure "fair" deals. "Smugglers' bazaar," says Gujar cheerfully. "All tribal-man, smuggler-man." Officially or unofficially, we have entered the tribal area; here the usual laws no longer apply.

Drugs are not the only contraband for sale. We pass by a big, new shopping complex that sells the latest in Western and Japanese goods, everything from kitchen stoves and refrigerators to televisions, VCRs and cassette players. Gujar pulls off the road, into a high-walled compound where several men are uncrating a shipment of Japanese appliances.

As we poke around the premises—cartons bear labels of origin from Japan, Western Europe, Hong Kong, even the USSR—Gujar explains how business works on the Khyber. Most of the goods entered Pakistan at the port of Karachi, ostensibly bound for Afghanistan under seals that avoid customs duties and import quotas. Once in the tribal area, their journey westward ends. "Only papers go to Afghanistan," Gujar explains, guffawing at the beauty of it. The goods are then sold to middle- and upper-class Pakistanis, anxious to buy household goods and luxuries that otherwise would be too expensive or unavailable. Some Khyber tribesmen have become immensely wealthy in the smuggling game, trafficking in everything from consumer goods to weapons and drugs.

It is a difficult situation. For most of the tribesmen, smuggling is a matter of survival. Approximately 377,000 people live in the Khyber district's 991 square miles, on a stony, desiccated, crumpled landscape that gets only 14 inches of rain a year and a thin sprinkling of snow. In the United States, this kind of terrain would be virtually uninhabited. Here in land-hungry Asia, it is home to an entire nation.

We drive on, and the first major landmark looms ahead: Bab-i-Khyber, the official gateway to the pass. The stone arch over the road was built by Field

Honor rules the Khyber Pass

Marshal Muhammad Ayub Khan's regime in 1963. As official architecture goes, it is actually quite nice; the arch, with its castlelike crenellations, gives one a feeling of crossing a frontier.

Off to the right, beyond a grove of slender, dusty trees, rises the grand, mud-walled mass of Jamrud Fort. Built in 1836 by the Sikh general Hari Singh, Jamrud represented the westernmost limit of the Sikh empire. Enraged by this monument of infidel imperialism, the Pathans swept down from the Khyber soon after the fort was built and ruthlessly slaughtered Hari Singh and many of his men.

Capt. John Wood, the British explorer, passed by Jamrud a few months after Hari Singh's defeat. He made some fascinating observations as he traveled through the Khyber, and his book *A Journey to the Source of the River Oxus* is one of the truly entertaining reads from the golden age of Central Asian exploration. The Sikhs and the Pathans were not fighting anything resembling a full-scale war when Wood and his party arrived, but the situation was still far from peaceful. While the Britons were negotiating for safe passage, the Pathans, in Wood's words, "showed their deep-rooted hatred of the Seiks, by cruelly murdering two defenceless grass-cutters, and making off with a herd of camels. . . . The bodies of the murdered men were brought into camp, one with the throat fearfully cut, the other a headless trunk." Still, like many later English visitors, Wood soon grew to like the Pathans, their forthrightness and genuine friendliness.

We leave Jamrud behind and set out across the plains between Peshawar and the mountains. The railroad tracks to Landi Kotal parallel the highway on the left. There are fortified villages here and there that belong to a tribe of Afridis. Gujar points out one of them as "Whiskey-man village—many man come from Peshawar, buy whiskey." Whiskey, of course, is as rep-

Loaded bus from border area is stopped; Khyber Rifle guard searches for terrorists from Afghanistan.

Pathans dominate the region's transportation trade, moving people and goods by camel, car, decorated bus.

Concrete "dragon's teeth" were built by the British in World War II so German tanks couldn't use the road.

Afghan Mujahedin lunch in Landi Kotal courtyard on return trip from Peshawar to their war-torn home.

rehensible as hashish or heroin, according to the tenets of Islam and the laws of Pakistan.

The east-facing slopes of the Safed Koh Range are upon us almost before we know it: fantastically steep, rocky, bone-dry, they look forbidding, impassable. The entrance to the Khyber Pass opens up suddenly, out of nowhere, a sleight of land, and then we are climbing, the mountains looming on either side, topped by the great massif of Tahtarra Peak.

As early as 1581, there was a bona fide road over the Khyber, built at the order of the Mogul ruler Akbar to help consolidate control over the rebellious Afghan portion of his empire. It made it possible to drive a wheeled carriage all the way from Peshawar to Kabul; even a traveler on foot or horseback could negotiate the pass in a day or two.

Then as now, the difficulties of the Khyber had to do with the people, not the terrain. The Khyber tribes didn't interfere with Akbar's road at first, but a few years later they grew restive and blocked the pass. He sent an army under his favorite general, Man Singh, to reopen the route, but the expedition, like so many other foreign ventures on the Khyber, ended in failure. Traffic over the pass eventually resumed, but only because Akbar gave up his idea of conquering the area by force.

We follow the coiling road upward, and a few minutes later we come to an old British graveyard near the impressive red-brick edifice of Shagai Fort, which was built by the British in the early part of this century. Grazda and I walk among the weathered headstones, reading the inscriptions, imagining the poignant histories that are only suggested here. According to the inscriptions on two of the simple slabs, Thomas Gannon and E. W. White were "killed" in 1919, perhaps shot by snipers firing from a distant ridge or slashed to death by fanatical assassins.

Hundreds of England's best and brightest died up here in futile, inconclusive campaigns that few present-day Britons recall at all, a futility presaged by Kipling's sardonic lines:

> A scrimmage in a Border Station—
> A canter down some dark defile—
> Two thousand pounds of education
> Drops to a ten-rupee *jezail*—
> The Crammer's boast, the Squadron's pride,
> Shot like a rabbit in a ride!

All that is left, ironically, is the respect the British earned from the tribesmen who ultimately defeated and outlasted them. None of the headstones in the graveyard has been desecrated or vandalized; the dusty pathways between the graves are clean, free of litter. Close by, there are British military insignia and regi-

Defeated Essex Regiment made last stand near Kabul in January 1842 during the First Anglo-Afghan War.

In 1879 Sir Louis Cavagnari (center) met Afghans and tribesmen to settle dispute; he failed and was killed.

one has repainted them recently and the colors blaze proudly in the sun. Whatever follies and crimes the empire committed here seem to have been forgiven, leaving only memories of honor, valor.

I remember a rheumy-eyed old tribesman I met three or four years ago in a refugee camp in Pakistan. His village, southwest of the Khyber, just west of the Pakistani-Afghan border, had been virtually destroyed by Soviet aerial bombardment and armored convoys. The old man reminisced fondly about his days fighting the British along the border, back in the 1930s. "The British were good to fight," he smiled, without a hint of sarcasm. "They were honorable men. When they were about to bombard one of our villages, they always warned us beforehand so we could move our women, children and old people to safety. When the fighting was over, we could sit down together and be friends. The *shorawi* [Russians] are not like that."

We leave the graveyard and Shagai Fort behind, pushing on, west. There is water in the bottom of the gorge now, and with it green fields, villages. There are also rows of strange concrete spikes, "dragon's teeth," in the riverbed. In the darkest days of World War II the British fortified the Khyber Pass, fearing that the Germans would break through Soviet lines and sweep across Iran and Afghanistan. From here to the crest of the pass there are clusters of these concrete fangs designed to impede enemy tanks, and networks of bunkers dug deep into the cliffs. According to Gujar, the local Pathans are making good use of these weird relics of a distant war. Families have set up housekeeping in the pillboxes and tunnels, and enterprising merchants break open the dragon's teeth to salvage and sell the steel reinforcing rods.

Unlikely visits by Buddha and Ali

Our next stop is Ali Masjid, the narrowest part of the pass. The walls of the inner gorge gradually narrow on either side, forming a bottleneck barely 15 yards wide. History has piled up here, accumulated over centuries and millennia-deep, some of it true, some of it myth, legend. Ali, the prophet Muhammad's son-in-law and, for Shiite Muslims, his successor, passed this way, the stories say; the place is named after him, and there is a lovely little shrine honoring the miracles he purportedly performed here. There is a crumbling Buddhist stupa, perhaps 1,600 years old, on one of the ridgelines; according to one tale, Buddha traveled across the Khyber. His footprint can be seen, they say, imprinted on a boulder somewhere nearby. All highly improbable.

The true stories of Ali Masjid are just as dramatic. Man Singh's army was besieged here—it is a perfect place for attacks and ambuscades from above—and the British fought several bloody, unsuccessful engagements with the Zakakhels and other local tribes. The Second Anglo-Afghan War began at Ali Masjid in 1878, when a British diplomatic mission was turned back by the Afghan commander Faiz Muhammad Khan.

But the most charming event features Babur, the marvelous writer, brilliant statesman and ruthless general who founded the Mogul empire. Passing through the Khyber in the winter of 1526, Babur decided to camp alone on a ledge above the crowded bivouac site of his army. He looked down at the "wonderful illumination" of the army's campfires at dusk, and the beauty of the scene so struck him that whenever he passed through Ali Masjid he celebrated by drinking wine.

A "lieutenant colonel" and his seedy corps

And then there was the self-styled "Lieutenant Colonel Rattray" and his seedy corps of soldiers-of-fortune, who were in command of the fort at Ali Masjid when Captain Wood and his party crossed the Khyber in 1837. Though Rattray was a fellow Englishman, Wood describes him as "ill-conditioned, dissipated-looking . . . slipshod, turbaned, and robed in a sort of Afghan dishabille—having more the look of a dissipated priest than a military man. His abode was a cave in the mountain, from which he and his hungry followers . . . a lean crew of . . . cormorants . . . levied blackmail on the passing Kafilas [caravans]."

It is still 23.5 kilometers to Torkham according to a roadside sign; time to push on. As we drive west, the gorge widens into a dry valley rimmed by crumbling cliffs and eroded mountains. Despite the inhospitable terrain, the local Pathans seem to be doing exceedingly well for themselves. One residential compound is at least 300 yards long, its adobe walls 8 yards high. We stop and Gujar leads us through the main gate. The interior is a paradise of graveled driveways, manicured hedges, lush rosebushes and elaborately tiled buildings. I ask Gujar the source of all this munificence, already knowing what the answer will be. "He big smuggler-man," Gujar grins.

We leave and drive on, passing more magnificent mansions. We pass by the dirt road that leads south over the mountains into the Bazar and Tirah valleys, where the Zakakhels are fighting their war. Eventually, if the violence doesn't wane, the Pakistani Army will have to go in there and subdue the combatants by force. I don't envy them. Last year, Grazda and I had the rare experience of crossing that rugged country on foot with a band of Afghan guerrillas bound for the battlefields of Nangarhar Province. It was tough, tough country, a cartographer's and infantryman's nightmare of twisting ravines, dead-end gulches and steep, slippery mountainsides, where a single well-

Michini Point is the last stop for foreigners visiting the Khyber Pass. The Pakistanis want to avoid kidnappings, violent border incidents, so only residents go through. The author was halted there but took time to admire the view of Afghanistan. He met an elderly Afghan refugee who told of his country's sad war, his longing to return.

placed sniper could hold up an entire battalion for hours, even days. The British fought a whole series of campaigns against the Zakakhels in the late 19th and early 20th centuries, across the uncompromising terrain, but they never really won a clear-cut victory over the stubborn tribesmen.

We are soon within view of Landi Kotal; it is near the summit of the pass and is the Khyber's largest, most important town. There are more emblems of the British raj here, set into roadside rocks, bright with paint. The Royal Sussex. The Gordon Highlanders. The South Wales Borderers. The Dogras. And many, many more.

This is the dividing line between the Afridi tribes and the Shinwaris, whose territory extends west into the mountains of Afghanistan. There is a different feel to the air, a sense that we have left the world of India behind. The wind that buffets us carries the dust of Central Asia, of Balkh, Samarkand, Mazar-i-Sharif. The dank green universe of Lahore, Delhi and Calcutta seems a million miles away.

This is Muslim Central Asia, and it always will be. When Jawaharlal Nehru came through here in 1946 with a delegation of Congress Party dignitaries, trying to rally the Khyber tribes behind what would have been a Hindu-dominated united India, the tribesmen attacked his motorcade with stones.

We drive into Landi Kotal, where in 1897 rebellious tribesmen destroyed a British military post, routing the 370-man garrison. It took the British four months to reopen the pass. At other times, Pax Britannica prevailed with surprising smoothness. When Robert Byron, the British Orientalist, art scholar and adventurer, crossed the Khyber in 1934 after an arduous journey across the hinterlands of Iran and Afghanistan, Landi Kotal was as peaceful as Shropshire; Gurkha troopers were playing field hockey, and on the road down to Peshawar open cars whizzed by, full of British officers in tennis whites. Still, it remains a volatile place. When Grazda and I passed through last year on our way into Afghanistan with the Mujahedin, the anti-Soviet rebels, we heard a few gunshots and a burst or two of automatic-weapons fire. A couple of times, what sounded like rocket-propelled grenades zoomed over the rooftops and exploded in the distance.

Today the town is peaceful. Passengers board a bus to Peshawar, old men gossip, shoppers haggle with merchants, children romp in the dusty street. We decide to stop for lunch. Gujar parks by the entrance to the covered bazaar and we descend the steep concrete steps into a maze of narrow, subterranean lanes. Landi Kotal's bazaar is reputedly one of the nerve centers of the global heroin business, but today it looks as innocent as a Sheboygan shopping mall. The little shops display cloth, perfume, mirrors, pocketknives, cigarettes; the most exotic item for sale is *naswar*, a green, powdery, native snuff. Merchants and passers-by greet us with smiles and "*Salaam aleikum*" ("Peace be with you"). We end up in a restaurant run by a friend of Gujar's, off an obscure alley. People gawk at us while we eat; foreign visitors have been few over the past decade, ever since the war in Afghanistan began.

Also because of the war, our permit is valid only as far as Michini Point, a high spur a few miles beyond Landi Kotal with a dramatic view of the border town of Torkham. We drive there later in the afternoon, and as I look out over this spectacular landscape—from the arid slopes below, across the Kabul River Valley to the jumbled confusion of dry mountains beyond—an old Afghan man approaches me, slogging up the moun-

tainside from the border, leading a pack mule. He is a remarkable-looking gentleman with startling blue eyes and the fluffy white whiskers of a Central Asian Saint Nick. He looks at me and smiles; then he turns and gestures as grandly as any impresario.

"Pakistan," he says, indicating the nearer slopes and ravines. And then, "Afghanistan," indicating the terrain beyond. When he says the name of his native country, there is a note of ineffable sorrow in his voice. Many people say the war in Afghanistan is almost over, but "almost" means almost nothing to a refugee, an exile. His country is lost to him; he can see it, but he cannot go there, cannot go home. (Since my visit to the Khyber earlier this year, the Russians have said they will quit Afghanistan, and large numbers of Soviet troops have been withdrawn. Still, almost all of the estimated five million Afghan refugees have hesitated to return home. The threat of continued fighting and millions of antipersonnel mines planted across the countryside have made repatriation dangerous. At Michini Point, Khyber Rifles continue to search eastbound buses for pro-Soviet terrorists sent in retaliation for Pakistani support of the Afghan resistance; since the war began, terrorist bombings have killed hundreds of civilians in Pakistan.)

On the way back down the pass to Peshawar, I think of war, of all the conflicts, tribal and imperial, that have ignited and burned in this tight, vital defile. I recall invaders from the ends of the Earth, like Alexander's General Hephaestion (Alexander himself crossed the mountains to the north of the Khyber), Babur and Aurangzeb; local heroes like the ferocious 17th-century poet-warlord Khushal Khan Khatak; and modern tribal warriors like Nadir Shah Iqbal and the gloriously named Tor Gul ("Black Flower").

The wars, big and small, still go on. When the Soviets are gone there will be other empires and wars. And the Pathans still fight one another. Two or three days after Grazda and I make our Khyber journey, the fighting among the Zakakhels grows so severe that the Pakistani government declares the pass off-limits to all foreigners. A week or two later it is still closed, as the tribesmen continue fighting; it is a battle over *nang*, honor, and such battles never really end.

The military insignia and regimental arms carved on tablets set next to the road are rarely desecrated. They offer testimony to the honor and esteem in which the tribesmen hold their former British foes.

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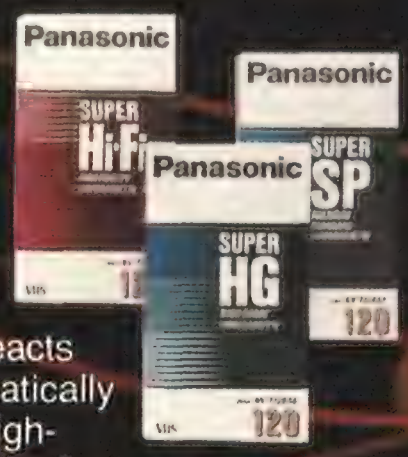

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CHAPTER FOUR

A pale sliver of moonlight streamed through the bedroom window. Clarice struggled desperately to stay awake. She dreaded the thought of enduring another nightmare. She dreaded the prospect of another encounter with the strange deformed figure who lurked in her dark dreams.

Suddenly, like a clap of thunder in the deathly nocturnal silence, an echo of footsteps rang out on the wooden stairway. It was a strange shuffle she had heard before. A clomp shuffle clomp shuffle clomp that was coming closer and closer — heading towards her room. As it stopped outside her closed door, she realized with a stifled scream where she had heard these steps before.

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CHAPTER FOUR
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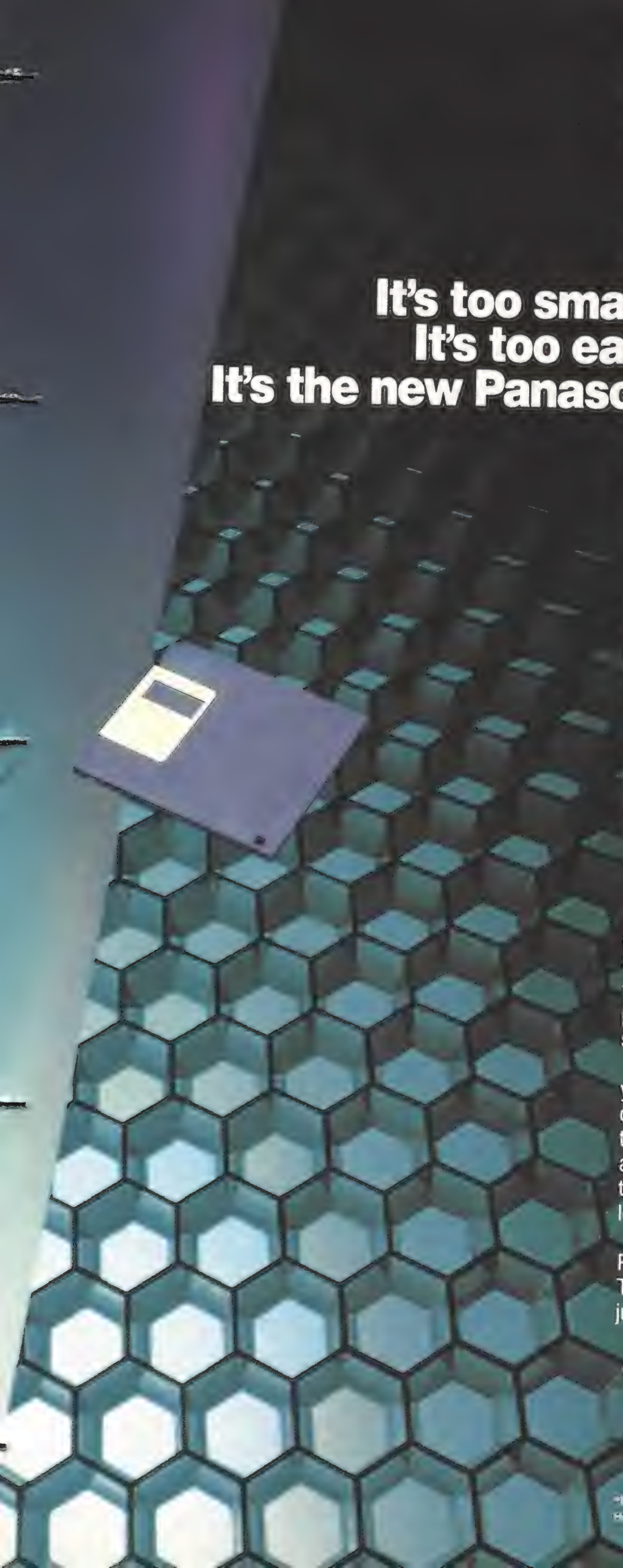

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By Helen Dudar

A man who invented himself, and kept right on inventing

First, Emmanuel Radnitsky changed his name to Man Ray; then he burst out creatively as an iconoclastic artist and photographer

Not long before he died in Paris in 1976, in the ninth decade of a long, amazing life in art, Man Ray turned those melancholy owl eyes upon a young assistant and said dryly, "You think you'll be finished with me after I'm gone, but you'll have another 60 years."

In the time since, his work has hardly gone unnoticed, but now is truly the high season for this incendiary spirit of 20th-century art. "Perpetual Motif: The Art of Man Ray," the largest exhibition of his work ever assembled in his native land, opens December 2 at the Smithsonian's National Museum of American Art, where it will remain through February 20, 1989. Then it moves on to the Museum of Contemporary Art, Los Angeles, the Menil Museum, Houston, and the Philadelphia Museum of Art, in the city of Man Ray's birth. The show is being supported by the Smithsonian's Special Exhibition Fund along with the National Endowment for the Arts and the Federal Council on the Arts and Humanities.

Timed to coincide with the exhibit is a healthy helping of printed matter including the first full-scale biography, *Man Ray: American Artist* by Neil Baldwin; a new illustrated edition of the 1963 autobiography, *Self Portrait*; a book about the artist's work, bearing the same title as the exhibition; and, in the Aperture "Masters of Photography" series, a book of his camera work.

All of this, possibly more, is needed to cover the protean range of Man Ray's interests. As we will be reminded for months to come, he was an early experimenter in abstract art; a progenitor and one of the most inventive spirits in the brief life of the Dada movement; an innovator in Surrealism; a maker of memorably witty objects loosely classified as sculpture;

Portrait of Man Ray shows him reflected in a distorting mirror; it was done in 1965 in a Manhattan gallery.

Self-portrait made in 1933 consisted of a cast of his head wearing glasses, in a newspaper-stuffed wooden box.

National Museum of American Art

Beinecke Rare Book and Manuscript Library, Yale University

A facility for handling oils is clear in Man Ray's 1913 portrait of the great art dealer Alfred Stieglitz.

a vanguard figure in film; a celebrated explorer of the art and craft of photography; and, perpetually, the wily mocker of contemporary life, manners, attitudes and, especially, culture.

Finally, inevitably, the iconoclast has become icon. Tempting though it is to imagine that Man Ray would have appreciated the irony—he was nothing if not an ironic commentator on the irrationalities of life—he could not, with honesty, have fully acknowledged the incongruity. The fact is that this proud breaker of idols had spent the later decades of his 86 years yearning for the kind of outsize recognition commonly conferred on the anointed figures of his trade.

Man Ray's first significant creation was himself. He grew up in Brooklyn and came out of high school determined to abandon a scholarship in architecture in order to study art. Toward that end, one of his earliest acts was to de-ethnicize his name and blur his background. Once he had begun to attract some public notice, members of his family were specifically instructed that they were never to talk about him with outsiders, never to discuss him for public print, never to jar the cloud of mystery and fantasy that would surround his beginnings.

He was the first of four children of hardworking, ambitious Russian-Jewish immigrants. His father was a tailor. So successfully did Man Ray obscure details of his early life—"I'd rather not discuss it," he would icily tell reporters questing for his birth name—that even obituary writers had trouble spelling the original. Man Ray began life as Emmanuel Radnitsky. When he dropped 11 letters to fashion his new identity, the family, hastening to abandon its roots as well, adopted the abbreviated surname.

The sweet shock of the new

As a child in Brooklyn, he tells us in *Self Portrait*, he had shoplifted paints to sustain a passion for art. Brushes he acquired "in a more legitimate manner." As a young man in Manhattan, he found jobs that supported his evening art classes and discovered comfort at Alfred Stieglitz's legendary Gallery 291. There, major new art and photography could be encountered on the walls, and the avuncular owner was happy to share his opinions and ideas, and occasionally to hang a Man Ray work.

Two events in that period shaped Man Ray's future. One was the epochal 1913 Armory Show with its stunning display of avant-garde art, notably Cubism; the shock was literally paralyzing. Months later, when he was able to paint again, the artist and his art had been irrevocably altered. Then, in 1915, Man Ray met Marcel Duchamp, that strange, enigmatic figure whose *Nude Descending a Staircase* (an "explosion in a shingle factory," an unfriendly critic called it) had been one of the sensations of the show. Although at the time neither could speak the other's language—Duchamp, newly arrived from France, was sitting out World War I in the States—they became and remained staunch friends and art revolutionaries.

The two men shared a delight in the outrageous, respect for the absurd, an eagerness to shock and demolish conventional notions of "art," and a willingness to experiment in the gallery and in public performance to the point of silliness. Together with another war fugitive, Francis Picabia, they became the founders of what would be known as New York Dada almost at the moment that the Dada movement was formally born in Zurich. "Dada": it means "hobbyhorse" in French, "yes" in Rumanian and Russian, "father" to babies, and is a nonsense word in almost any language. The movement would burn out in a half-dozen years, but for as long as it lasted, the creations of Dadaism made a mockery of the idea of safe, rational, comfortable bourgeois culture.

Helen Dudar, a New York writer and critic, wrote about the newly remodeled Chicago Art Institute in August and about David Hockney in February.

By the time he encountered Duchamp, Man Ray had migrated to rural Ridgefield, New Jersey, which sheltered a small artists' colony. There he settled down with Belgian poet Adon Lacroix, whom he later married, and worked away at some major paintings. After two years he returned to New York, at which time he painted the lovely, nearly abstract *The Rope Dancer Accompanies Herself With Her Shadows* (below). He soon found a New York dealer who was willing to hang his pictures. He flaunted the Dada spirit in, for example, an assemblage with a bell that did not ring, and in a painting that could not be hung straight. The shows were uniformly denounced by the critics and, forever after, Man Ray returned their disapproval with unforgiving dislike.

By 1921 his marriage to Adon Lacroix had collapsed in bitterness over her infidelity and, if we are to believe the autobiography, it ended violently. Man Ray, a small man with the physique of a sparrow, claimed to have beaten her with his belt. Then, steadied by a $500 loan from a patron, he boarded an ocean liner bound for France. In *Self Portrait*, he tells us that he arrived July 14—Bastille Day, traditionally celebrated with great displays of fireworks, surely a worthy symbolic salute for a man fleeing his past.

There was nothing wrong with Man Ray's memory, but he did enjoy dramatizing himself. By assiduous sleuthing, art historians Billy Klüver and Julie Martin, coauthors of an essay in the book that accompanies the exhibition, discovered that his ship, the *Savoie*, docked in Le Havre eight days after Bastille Day. Merry Foresta, curator of the exhibition, who spent five years laboring on this show and is an unyielding partisan of his work, has concluded that large parts of the memoir are retrospective elaborations. Still, she agrees that like any good fiction, the book probably has a kind of artistic truth.

In Paris, Man Ray was welcomed not only by Duchamp but by the resident avant-garde as well. A half-century later, in an interview with a French journalist, he would offer a roseate memory of that heady time: "I, who was persecuted in New York like a drug addict,

Museum of Modern Art

After watching a vaudeville show, Man Ray went right home and made a series of sketches. From them he later painted this perfectly realized work, *The Rope Dancer Accompanies Herself With Her Shadows.*

Gilman Paper Company Collection, New York City

The artist's famous portraits were usually of famous people, here Nancy Cunard.

Philadelphia Museum of Art

His vivid imagination placed an eye on a metronome, thus producing *Perpetual Motif*.

J. Paul Getty Museum

Innovative technique, as always, was employed in portrait of wife, Juliet.

like a madman, for the art I showed, was accepted here, not by everyone of course, but among the Dadaists . . . I was accepted. It was marvelous, I decided to stay." Before the year was out, he had a show—the first Dada event of the season and the last ever, according to Klüver and Martin. The movement had fallen apart through squabbles and public boredom. And, led by André Breton, Surrealism, with its embrace of the Freudian landscape of dreams and the unconscious, had arrived as the new theology of art.

Having failed to sell a single painting from his show, Man Ray faced up to the problem of supporting himself. Back home, he had learned his way around a camera both to create works of art and to photograph them. Why not shoot pictures to pay for oils and to put croissants on the table? The result was doubled-edged, offering immediate salvation along with a long-term curse. He became so successful as a photographer that he confused the academic establishment permanently. Some critics would forever insist that photography was his true medium, that his work behind the lens was better than any Man Ray painting—a judgment that dismayed and outraged him.

The camera work *was* notable. He blossomed as a fashion-magazine photographer with a striking, offbeat style. He shot what became famous portraits of most of the famous creative figures of the time: Joyce, Eliot, Tanguy, Brancusi, Giacometti, Matisse all sat for him. Jean Cocteau roused him out of sleep (or a depressive state) early one day with the demand that he photograph Proust on his deathbed. He drove fast cars, attracted a number of beautiful women and traveled in chic circles. Picasso not only was a subject but became a friend. It was said that no rich, fashionable woman of high society could come to Paris without having her image recorded by Man Ray. With his gift for exploiting lucky accidents, he also developed an odd sideline in darkroom art: spooky, cameraless pictures he called "rayographs"—photographs created by leaving objects on sensitized paper while it was exposed to light (opposite). Viewing some of them, Cocteau called him the "great poet of the darkroom."

In two decades of living and working in Montparnasse, his favorite Left Bank neighborhood, he made some indelible images and objects: *The Gift*, a flatiron rendered menacingly useless by an arrangement of upended tacks on its ironing surface; the metronome with a photograph of a woman's eye attached to the tip of its arm; the painting entitled *A l'heure de l'observatoire—Les Amoureux* (*Observatory Time—The Lovers*), with its eight-foot disembodied feminine lips hovering in the sky over a Parisian landscape (pp. 66-67).

J. Paul Getty Museum

A study of his mistress Kiki's back was given the title *Le Violon d'Ingres*.

Gerard Levy, Paris

Rayographs, such as this one, were made in studio with light, no camera.

Man Ray Trust ADAGP

Ernest Hemingway was portrayed with banjo halo as symbol of writer's Americanism.

Man Ray harbored no false humility about the significance of his art. "I have a superiority complex," he liked to say. The "happenings" of the 1960s were foreshadowed by the cuckoo theater of Dada, 40 years earlier. Pop Art's discovery of the common object as a subject for art and sculpture was, in its way, an emulation of Man Ray's Dada-Surrealist imagery. James Rosenquist, Roy Lichtenstein, Claes Oldenberg, Andy Warhol and Christo are each indebted, and in some cases have acknowledged a debt, to Man Ray's creative force. "Pup Art," he sniffed contemptuously about a work by Lichtenstein, while touring a 1970 Paris show.

One of his most reproduced pieces was the photograph of a woman's elegant naked back, with sound holes painted on either side, the kind of visual pun he loved to make. Entitled *Le Violon d'Ingres*, the figure recalls an Ingres painting (above). In French, the title is an idiom meaning one's hobby. The model was Kiki of Montparnasse who, it could be said, matched the title: she was Man Ray's mistress for some years.

He should have been a happy man, and a few cheerful snapshots from the period certainly exist. Still, Neil Baldwin reports, he was subject to severe depression and would take to his bed for days to nurse himself through a serious funk. In his memoir, Julien Levy, the seminal New York dealer in Surrealist art in the '30s and '40s, writes of this master of satiric art as "always dour." Emotional disappointment could render him inconsolable. In the early '30s, Lee Miller, a blonde American beauty who would become an important photographer, went to Man Ray to learn her way around the camera, which she did. They also lived together for a while and then she left him for another lover. Levy records the discarded artist as "half-dead with sorrow and jealousy. . . . it was reported dangerous for anyone to be seen those days with Lee. . . . Man had a revolver and . . . was threatening any other rivals who might materialize."

In short order, a more authentic danger lurked on the horizon. War came, and in 1940 the German Army arrived. Man Ray, in the company of the American composer Virgil Thomson, took flight, racing to safety a few steps ahead of the invaders. He sailed home, but instead of finding refuge in the East, headed straight for Hollywood where life was hardly Parisian. He liked to say that he had been en route to Tahiti when the benign climate and palm trees of the movie colony caught his attention. His friend, one-time dealer and fellow artist William Copley, never heard him mention Tahiti but would not dream of challenging the claim. "Man Ray had a kind of running mythology of himself which he would perform in order to pass

off his bons mots. He was something of an actor."

Copley thinks it likely that Man Ray went West in hopes of attracting the interest of the film industry. After all, in Europe he had turned out four short, highly regarded Surrealist films. It would not have occurred to him that the last thing that would have excited a Hollywood producer's interest was a real, live, committed, avant-garde artist.

Los Angeles was not a happy place for him. Famous for photography, he wanted to be noticed for his other art. While he shot an occasional picture of a film star, he was in flight from his reputation as a camera artist and pretty much gave up film as a professional medium. Most of the painting of his Paris period had been left behind—safely hidden, it would turn out. Although his work was shown at some local museums, he seems to have been viewed by the art community as a relic, a ghost out of the dim past, rather than as a contemporary creative figure.

In large part, he supported himself by teaching and lecturing, and he settled down with a new striking young beauty. Juliet Browner, who had danced with Martha Graham and had lived with Willem de Kooning, would provide the kind of selfless, wifely devotion without which the average working artist seemingly cannot find his way through everyday life.

When peace came, Copley, a young man of means just released from military service, set out to establish a gallery of Surrealist art off Rodeo Drive in Beverly Hills and to lure Man Ray to his premises. It was not easy. "He had had a show in Pasadena which was virulently attacked," Copley recalls. "It made him very bitter. He didn't want anything like that to happen again." Copley remembers that he had to argue even more strenuously to persuade him to include some memorable photographs in the show.

Man Ray finally succumbed, with unhappy consequences. Only the setting was a success. For the occasion, Copley transformed his gallery into a French café complete with checkered tablecloths and onion soup. The title for the catalog of his Copley show was a typically sardonic play on the absence of stardom: *To Be Continued Unnoticed.* Copley remembers the reviews as "vicious." The nicest published comment was *Art Digest*'s conclusion that the work was interesting "to those who care." Surrealist art had a distance to travel before much of the art-consuming public would understand its significance. In the 18 months before Copley closed his gallery, the young dealer found almost no customers other than himself. He had a policy of buying a few works from each failed show, a practice that left him with an extraordinary collection, which he auctioned off in 1979. He cannot recall how much he paid for *Observatory Time*, the picture he calls "The Lips"—a few thousand dollars at most. At the auction, it fetched $750,000. As the bidding escalated insanely, Copley sat in the Sotheby auction room collapsed in helpless laughter. "I kept thinking how mad Man would have been."

Private collection

A l'heure de l'observatoire—Les Amoureux evokes an imprint of Kiki's lipstick on Man Ray's shirt collar.

After a time, Copley abandoned dealing and took up painting, as well as writing. He is responsible for that felicitous phrase honoring Man Ray as the "Dada of us all," which came to be repeated to the verge of monotony. As the years went by, sunny California began to seem less and less hospitable. One day in 1951, Man Ray stopped by Copley's home and said, "You know, I've really had it with this town." "I have too," Copley agreed. "The next day, we were on our way to New York and in a few days aboard the *De Grasse*, sailing to France."

Man Ray settled down again in his favorite Montparnasse neighborhood around the Place St.-Sulpice, worked at his art, suffered through some fairly threadbare years, spent more than a decade working on *Self Portrait*, gave interviews in which he nearly always quoted himself ("I have never painted a recent picture"; "I never paint because I am a painter; I paint because I have an idea") and, from time to time, showed his work. In 1957, a mob of art students invaded a Dada show at a Left Bank gallery and seized the Man Ray metronome piece. The work bore the title *Object to be Destroyed*; in a perfect Dada gesture, the young invaders trampled it to splinters. Copley, like Man Ray, remembers the event as a right-wing assault, although contemporary news accounts suggest the bashers may have represented the left end of the esthetic spectrum. Man Ray was amused and delighted. "*That* was recognition," Copley observes. The piece was remade, the second time as *Indestructible Object*; finally, there was a multiple edition called *Perpetual Motif*, a title that, to the organizers of the current show, seems to sum up the life's work neatly.

The memories recounted by Man Ray's surviving friends are fond ones, for the most part. He was "very sharp, affectionate and sweet," in the words of Arne Ekstrom, a New York dealer. He could also be tiresomely grumpy. He had an enormous vanity—watered by neglect. The renowned Cordier & Ekstrom gallery gave him three shows between 1963 and 1971, and there were other salutes here as well as abroad.

It was never enough. And when it was finally adequate to the subject, the celebration seemed too long overdue to be relished. In 1972, the Musée de l'Art Moderne in Paris mounted a huge Man Ray retrospective. The artist was 81 and, by then, crippled by the infirmities of age. He came in a wheelchair. Sometime afterward, an American wire service reporter stood at his side while Man Ray leafed through the exhibition's elaborate catalog murmuring, "It's too late, too late." But even then the irrepressible flame of mockery was still flickering in that frail little body. "If this had only happened 40 years ago," he sighed, "I might well have been encouraged."

À L'HEURE DE L'OBSERVATOIRE —— LES AMOUREUX

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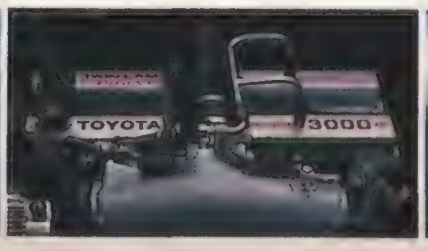

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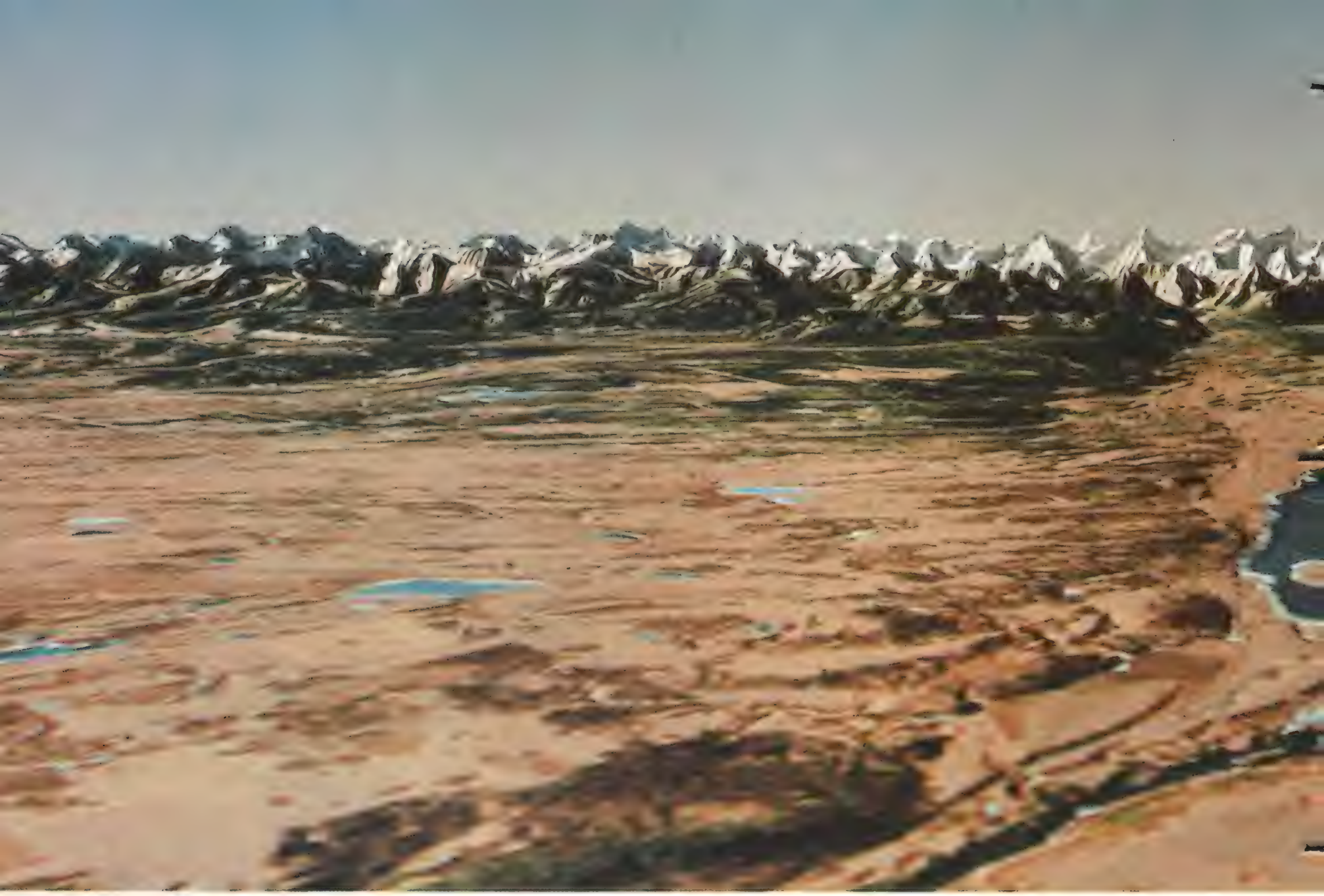


Superrealistic computer view of Canadian Rockies is made from images collected by French SPOT satellite.

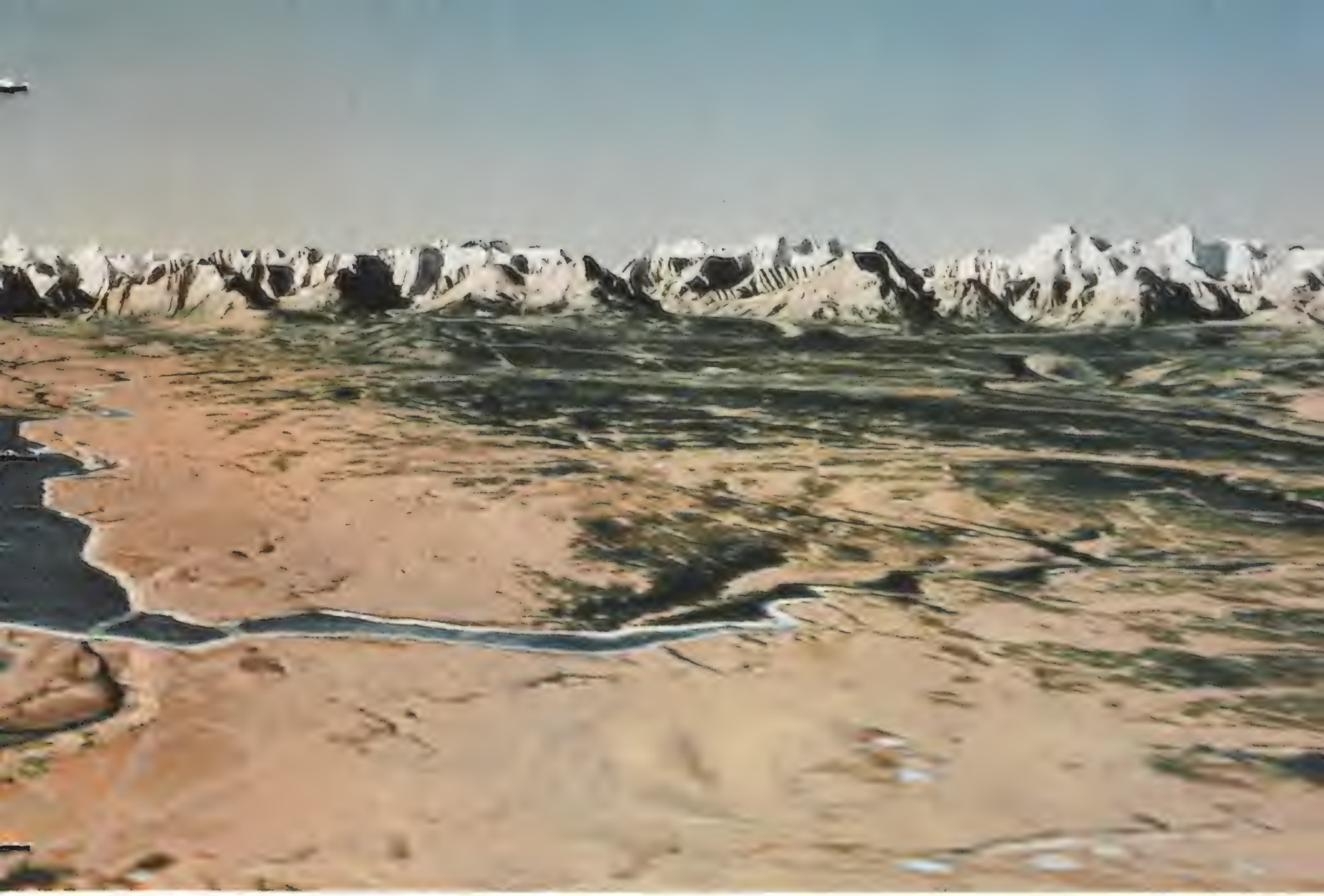
By Doug Stewart

Eyes in orbit keep tabs on the world in unexpected ways

Whether tracking whales, relaying telephone calls or exploring the Universe's bounds, satellites bring lofty information down to Earth

Before he started using satellites, Bruce Mate worried a lot more about polar bears than he does today. "The Arctic is an unforgiving place," says Mate, a marine biologist at Oregon State University's Hatfield Marine Science Center in Newport, whose specialty is tracking whales throughout the Northern Hemisphere. The usual way to track a whale is to outfit your quarry with a radio transmitter, then try to stay within 30 miles of it by ship or by plane (otherwise the curvature of the Earth and other factors block the signal). In the Arctic, Mate explains, this procedure is not only difficult and expensive, but dangerous to boot. The unpredictable Northern seas are empty, cold, often stormy, and dark for months on end. And if you step ashore anywhere, you're apt to encounter the large, white carnivores.

Mate not long ago hit on the clever idea of letting a weather satellite try tracking a whale instead. Thus when biologists at the New England Aquarium nursed three sick pilot whales back to health and released them in late 1987, the largest of the trio, aptly named Tag, was wearing a four-inch, battery-powered satellite tag on its dorsal fin. The gadget, which Mate



Scene is from sequence, used in TV broadcasts of 1988 Calgary Olympics, that simulated flying over range.

adapted for whale tracking, contained a radio transmitter that revealed where Tag was, how long and how often he dove, and how warm the water was. Its signal was beamed up to a weather satellite as it passed overhead. The satellite in turn relayed the information back down to an Earth station, then to a large computer in Maryland, and eventually to Mate's computer in Oregon. "With the satellite," he says proudly, "I can sit here at my computer and get information from a free-ranging whale anywhere on Earth."

Invisible though they may be, satellites today are becoming almost as useful as photocopy machines and overnight mail. The crowning achievement of space science, in fact, is probably neither the Moon landings nor the Jupiter flyby but rather the countless terrestrial uses, large and small, that people have found for Earth-orbiting satellites. Many of these jobs were never intended by the satellites' designers. The people who built the first weather satellite in this series, launched in 1978 for the National Oceanic and Atmospheric Administration (NOAA) probably didn't expect that the satellite would be used to track whales, camels, swans, dugongs, elephants and racing yachts. The folks at the Defense Department who devised Navstar as a guidance system for ships and missiles couldn't have predicted that surveyors would use the satellite's signals to chart the precise path of the new English Channel tunnel to within a fraction of an inch. And the designers of the camera-toting Landsat satellites undoubtedly never foresaw that potato farmers in Oregon's Columbia River basin would use their spacecraft to make sure that irrigation sprinklers were in good working order.

Indeed, the Landsat series of Earth-imaging orbiters has had a particularly illustrious career over the past 16 years, from mapping mountain ranges to monitoring forest fires. NOAA recently turned the entire Landsat operation over to a private outfit called the Earth Observation Satellite Company, or EOSAT. During a visit to EOSAT's headquarters in suburban Lanham, Maryland, I look over the shoulder of image analyst Meg Noah as she demonstrates what Landsat-5 can do. Noah is sitting at a computerized color TV screen on which she calls up a rapid succession of spectacularly detailed photographs from space—rocky cliffs

In Oregon, Bruce Mate views data sent by satellite from tagged whale off Cape Cod; on monitor, orbiter's path.

in the Mojave Desert, pollution in the Mississippi River, the pyramids of Egypt (with a swimming pool at a nearby tourist hotel clearly visible).

"Here's a full scene," she says as she summons up a patch of southern Florida roughly 100 miles on a side (p. 74). "I can see some burning fields. See the smoke?" Noah, fast-talking and extremely nimble-fingered, zooms in for a close look at various parts of the scene, maneuvering the controls as deftly as a Pac-Man pro. "There's Turkey Point Nuclear Reactor," she says, pointing, "and that's a big cooling pond." There are trees growing in the cooling pond, she reports. She calls up a different version of the same view, this time with temperature readings highlighted (p. 75). Suddenly the pond is layered in color: yellow and orange nearest the reactor, then green, light blue and dark blue. Joining us, EOSAT publications editor Mark Eustis asks if we can tell which way the prevailing wind blows. We give up. He points to a narrow rectangle, darkened at one end. "That's an airport runway," he says, "and those are skid marks at the end where the planes usually land."

Much of the detective work that Landsat makes possible is subtler still. The satellite's sensor picks up six different wavelengths of sunlight (including some invisible to the human eye) reflected by rocks, water or foliage. It can also detect heat radiated from Earth's surface. By combining and comparing these narrow spectra, an analyst can choose to highlight the water content of foliage, for instance—to detect crops that are not absorbing enough water, say, even before a farmer on the ground would notice the leaves beginning to droop. Other analyses are more straightforward, but equally clever. "We had a customer who was measuring penguin populations in Antarctica by sitting in his Maryland office and looking at the reflectivity of the penguin guano deposits," says Eustis approvingly. "It's cold down there. You don't want to go to Antarctica if you don't have to."

EOSAT's rival in the space-photograph business is SPOT, a French satellite whose photographs are even sharper than Landsat's. Where Landsat's cameras can resolve objects about 100 feet apart, SPOT's can show objects that are less than 35 feet apart. In addition, SPOT can produce pictures in 3-D. The Soviets have recently entered the market with photographs from space that boast even better resolution than SPOT's. The Defense Department is rumored to have a spy satellite the size of a school bus and able to take pictures that can distinguish between the pickets on a fence.

For most people, the idea of something the size of a school bus hurtling through the sky at several miles a second, with or without a camera, is nearly inconceivable. That these devices can perform their jobs without operators, air, electrical outlets or regular visits from the repairman seems even more improbable. To understand how satellites manage to do this, one needs to know something about the nature of orbits.

"An object in orbit is like a person on a roller coaster," offers Ivan Bekey, NASA's special assistant for systems engineering and planning integration in the office of exploration, when I pay a visit to his office just off the Mall in Washington. "When you're coming over the top of a roller coaster, you feel as though you're left up in the air for a few seconds. Well, a satellite in low-

Massachusetts freelancer Doug Stewart last wrote for SMITHSONIAN *on stone quarries (October 1988) and on portraitists and their subjects (July 1988).*

Earth orbit is *always* just coming over the top of the roller coaster." The constant curve of a satellite's orbit as it circles Earth is much flatter than the curve at the top of a roller coaster, of course, because the satellite's speed (17,000 miles per hour) makes up for that.

The tremendous usefulness of machinery placed in orbit, Bekey says, comes from the benign environment of space. "Once you invest enough energy to get up there," he says, "it doesn't take any more energy to stay for long periods." Bekey, an engineer, is a no-nonsense, slightly grumpy veteran of the aerospace industry, but when he expounds on the pure beauty of orbital mechanics, a schoolboyish enthusiasm emerges. "In orbit, there's free power in abundance, from the sun," he says. "There are no vibrations, no air resistance and no gravitationally induced forces." Large, delicate structures that would collapse of their own weight if they had to resist Earth's gravity, structures with all the aerodynamic characteristics of a giant umbrella, fly admirably in the weightless, windless void of orbital space.

Bekey is quick to point out that not all satellites are man-made creations expressly designed for orbit. "A satellite can be a bolt, an old rocket tank or a piece of sand," he says. Anything caught in orbit around a heavier object in space is a satellite. The Moon and Earth are both natural satellites revolving around larger bodies. Space capsules and space shuttles in orbit are satellites and so, too, was the Hasselblad camera that Gemini astronaut Michael Collins dropped during a space walk in 1966 (SMITHSONIAN, May 1988).

The space shuttle can deploy satellites, like the one shown here, as well as service and retrieve them.

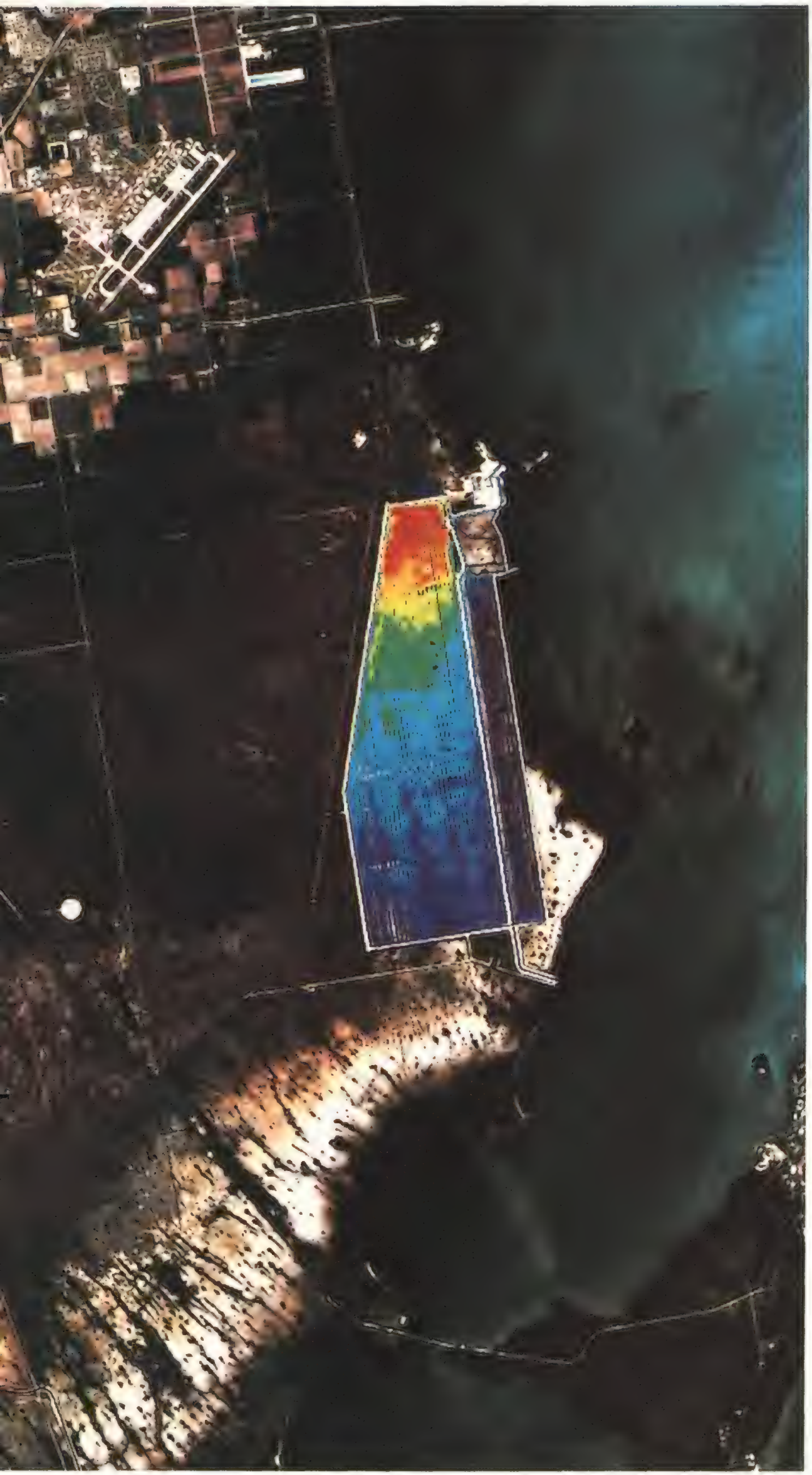
Orbiting switchboards — or tin cans?

The Hughes Aircraft Company, a world leader in satellite manufacture, has constructed orbiting devices of all sizes for a variety of purposes. One of the most successful models was a series of nearly identical general-purpose communications satellites that Hughes mass-produced by the dozens during the 1970s and '80s. Once settled into orbit, the cylindrical device would stretch out like an old-fashioned spyglass, and a dish-shaped antenna would unfold at one end, making the craft resemble a tin can with its lid raised. Canada, Indonesia, Mexico, Australia and other countries snapped up these orbiting switchboards as fast as Hughes could build them, using them to relay phone calls and domestic television programs.

"That little baby used to be our bread and butter," George Tadler tells me when I visit Hughes Aircraft in Los Angeles for a tour of its sprawling satellite factory. Tadler is spacecraft manager for the little can's successor, a very big can called Intelsat-6. With a total length of 39 feet and a weight of nearly 4,000 pounds without fuel, Intelsat-6 satellites cost roughly $35,000 a pound, five times as much as gold. Each one can relay 60,000

At Hughes Aircraft, balloons hold up dish antennas on Intelsat-6, the only way of simulating zero gravity.

Text continues on page 76



Opposite: Image taken from 438 miles above Earth by Landsat-5's sensor shows area of southern Florida roughly 100 miles on a side. Composite image was made by combining information from three distinct wavelengths of light energy, highlighting moisture, vegetation, and highly reflective urban and pavement areas. Darker hues indicate greater moisture content. Black and dark blue bodies are Lake Okeechobee (top), Gulf of Mexico (bottom left) and Atlantic Ocean (right). Indentation on eastern coast is Biscayne Bay. Lighter blue, pink and orange region above and around bay is metropolitan Miami. Alligator Alley runs across image just above center, and is nearly paralleled by Tamiami Trail below. Red and dark orange areas throughout contain the densest vegetation (such as large stands of mangroves along Gulf coast), while the yellow area at top left indicates rangeland. Green rectangles (top center) are fallow fields (some wetter than others), while green areas at bottom are grasslands and swamps. The green trailing from small red "islands" of larger vegetation in the Everglades shows the southerly flow of water. Black rhomboid southeast of city (lower right) is a cooling pond for Turkey Point Nuclear Power Plant, and is shown enlarged in closeup on this page. In this image, satellite's sensor captured visible as well as infrared wavelengths. The latter show temperature gradients (with red being the hottest and blue the coldest) in the cooling pond. The resolution on closeup image is fine enough for an expert viewer to be able to discern the skid marks on the southern end of the Air Force base runway located in the upper-left corner. The satellite's sensor can resolve objects that are only 100 feet apart or less. Such data-filled images as those shown here are of immense use to mappers, natural resource managers, city planners, and geologists, to name just a few.

In this videoconference, relayed to them by satellite, doctors at the Mayo Clinic located in Rochester, Minnesota, can discuss the x rays and prognosis of a patient being treated by some of their colleagues at the clinic's new center in Scottsdale, Arizona.

long-distance phone calls at the same time, and operate three TV channels as well.

In an enormous "clean room" called the high bay, Tadler shows me several Intelsat-6s in various stages of assembly. Dominating the room is the Intelsat-6 closest to completion: a skinless cylinder 12 feet across, whose innards are a fragile jumble of fuel tanks, tiny rocket nozzles, wires, gold and silver foil, pipes the thickness of soda straws, electronic circuitry and assorted radio paraphernalia. Though Tadler and the other white-coated workers bustling about the high bay refer to it as a "spacecraft," I have a hard time reconciling its ungainly, vulnerable appearance to images of sleek, shiny rocketships I've always associated with the word.

Perched on top of the cylinder is a pair of huge, white, dish antennas—"Mickey's ears," Tadler calls them—that will reflect and focus the radio signals sent to and from Earth. Rising high above the spindly arms holding up the antennas is a bouquet of large helium balloons (p. 73). To check the exact alignment of Mickey's ears, which a pair of engineers on the floor is now doing with surveying tools, Tadler's crew has to do what it can to simulate the zero gravity of orbit, a tall order in the one-G environment of Los Angeles, hence the balloons.

The antenna booms are as critical as the antennas themselves. "All the mechanisms are designed to operate only in zero G," Tadler says as I walk with him around the satellite, taking care not to touch anything. "After we tie the balloons to the booms, we can activate all the devices that cut the screws or pull the pins or whatever is holding a boom in place, to make sure it all unfolds properly." An Intelsat-6 that hasn't unfolded correctly in orbit is a $140 million flying junkyard. When people unfold an ironing board here on the ground, they can always give a recalcitrant leg a kick. In space, that's unlikely to be an option.

In a storage area off to one side of the high bay sits a small, forlorn-looking satellite whose solar-paneled exterior is covered with what appear to be hundreds of pieces of first-aid tape. The device is Westar-6, a satellite whose booster rocket failed after it frisbeed out of a space shuttle in February 1984. Westar-6 is back on Earth, ready for refurbishing, having been rescued by a second shuttle crew later that year. The pieces of white tape temporarily mark all the pits that micrometeorites left in the shell of the satellite during a mere ten months of low-Earth orbit.

Luckily for Intelsat-6, its designed orbit is much higher—nearly one-tenth the distance to the Moon, in fact—where the emptiness of space is emptier yet. The rarefied altitude of 22,300 miles, moreover, has a special value for communications satellites. "A satellite at that altitude," says Harold Rosen, a Hughes veteran who helped design the first such object nearly 30 years ago, "takes the same time to complete an orbit that Earth takes to make one turn—24 hours." The reason: the higher an object of any size orbits above Earth, the gentler the pull of gravity is and thus the slower its speed needs to be to stay aloft. "The astronauts in the shuttle make orbits in about an hour and a half because they're just above the atmosphere," Rosen says. "The Moon, which is 230,000 miles up, takes 28 days to make an orbit around Earth."

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If the satellite circles Earth every 24 hours, Rosen explains, and does so above the Equator, in effect it hovers over the same spot, day and night. This so-called geostationary orbit is the key to the almost magical talents of modern communications satellites. By seeming to float in place, they can function as the tops of imaginary broadcast towers high enough to "see" more than one-third of Earth's surface at a time. From an earthling's point of view, a satellite that seems to be parked overhead makes possible a backyard TV dish that can easily pull down volleyball from Alaska or a circus from Brazil, depending on which satellite the dish is pointing at. (The man who first proposed launching geostationary satellites, in 1945, was not a space scientist but rather Arthur C. Clarke, author of the science-fiction classic *2001: A Space Odyssey*. Clarke envisioned them as full-fledged space stations.)

Rosen went to work at Hughes as an engineer in 1956, the year before the Soviets launched Sputnik. As he sits in his office toying with a small glass paperweight containing a model of Intelsat-1, or Early Bird, a 1965 satellite little bigger than a bass drum, Rosen recalls some of the designs that competing engineers struggled with in the early '60s. "There was Echo, which was a giant, aluminized-Mylar balloon," he says. Echo was simply a shiny ball off which radio signals from the ground could be reflected, "until the gas that pressurized it leaked out and it became prune-shaped, losing efficiency in the process." A variation on this idea of so-called passive satellites was Project West Ford, a free-flying cloud of small metal needles released into low-Earth orbit. At any given time, the theory was, enough radio waves could be reflected off the needles to generate a receivable signal. "I thought that was an outrageous scheme," says Rosen, still amused. The project never got off the ground.

Space station, the largest artificial satellite, should be ready to be serviced by shuttles sometime in the 1990s.

Peeking in on an electronic get-together

Among all the uses to which communications satellites like Intelsat are put, the most elaborate is no doubt the videoconference. In these electronic get-togethers, the participants stay where they are, whether in different cities or different countries, while the satellite provides a closed-circuit television hookup. To get a feel for the medium, I peek in on one end of a videoconference on a recent afternoon at the Mayo Clinic in Rochester, Minnesota.

Alone in the clinic's telemedicine room that afternoon, Dr. Steven Ory, a reproductive endocrinologist and infertility specialist with a calm, professorial manner, consults by two-way video with a doctor and patient in the clinic's new Jacksonville, Florida, medical center. A pair of remote-controlled TV cameras are set into the room's walls, and a third camera with a zoom lens is mounted on the ceiling. A color TV monitor is positioned next to each wall camera to give the illusion of eye contact. The patient this afternoon is a married woman in her early 40s who is hoping for good news from Ory about her chances of bearing a child.

On a small black-and-white monitor in a control room next door, I watch and listen as Ory asks questions of both doctor and patient. Ory's head fills the screen momentarily as he leans forward to study x rays and lab reports that the Florida doctor lays out for the overhead camera. Ory leans back again and tries to be as gentle as he can. "It's difficult to be completely rational about this because having children is such an intensely personal desire, but I can't recommend more surgery with any enthusiasm," he says into the camera. On a second control-room monitor, I hear the woman's uh-huhs as she nods her head and watches Ory's video face intently, her brow furrowed. She presses Ory to admit that a pregnancy is still possible. "There's very little we can do," he concludes. "There's

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Tethered satellite, being developed, will be attached to shuttle 12 miles away to test Earth's magnetosphere.

a very high cost for a very slight chance of being effective." As he speaks, the woman's voice is clearly audible at the same time, almost in a whisper: "Yes . . . I can understand that."

After the session, Ory tells me that doctors and even first-time patients quickly forget that the two sides of these conversations are separated by a gulf of thousands of miles. "You become immersed in the TV screen," he says. "The only thing I can't do is put my hands on the patient." That the link between doctor and patient depends on a distant satellite probably seldom occurs to anyone.

Just as the Mayo Clinic's physicians are already taking satellites for granted, like electricity from an outlet, so more and more uses for satellites will no doubt be devised and, ultimately, accepted as routine in the years ahead. Now that space shuttle flights have resumed, a flood of new satellites will begin heading spaceward. NASA's Ivan Bekey is a champion of the most ambitious satellite to date, the Hubble Space Telescope (opposite), basically complete and awaiting launch. Flying high above the optically aggravating shroud of air that hugs Earth, the 12.5-ton instrument (which costs as much as ten Intelsat-6s) will be able to take pictures of stars at the fringes of the Universe, invisible to the biggest telescopes on the planet.

Eventually, Bekey believes, whole new types of satellites will take up orbit around Earth. Framed paintings of several of these adorn his office wall, just above bins of folders marked "Space Tether," "Geosync Space Station" and a particularly voluminous category, "Other New Concepts." One of the paintings depicts something called a space platform, a huge assembly of trusses and dishes and solar panels. Satellites would be plugged into and pulled out of these permanently orbiting, fully serviced frames as needed. "Like a condominium," Bekey says. "You buy a space and move in. You don't have to bring your own water or power lines or sewer lines with you." Next to this painting is one of the space tether. This is a taut cable perhaps 60 miles long that would connect two separate spacecraft as their combined center of gravity maintained a stable orbit. Eventually, if that orbit were geostationary and the tether were long enough, a spacecraft at one end could be lowered straight down to Earth like an elevator, to pick up passengers and cargo. At the other end of the tether, well beyond geostationary altitude, the second craft would be yanking upward to keep everything balanced.

The ultimate version of the space tether is the skyhook, a solid tower stretching from Earth's surface into space. Bekey doesn't have a painting of this on his wall, and no one has proposed funding one, but he clearly likes the idea. "If you could build a tower whose top half was above geostationary orbit, you could climb up, jump out and be in orbit. You wouldn't need rockets." The tower would exert little or no pressure on the ground, since technically the whole construction would be in orbit. The top half would be pulling against the bottom half, however, so the internal stresses would be fierce. So fierce, Bekey admits, that the only known material strong enough for the job is pure diamond. "Building a tower out of diamond wouldn't be impossible," he says, ever the optimist, "but if I knew how to make enough diamond for that, I'd probably just make a little bit and sell it instead. Then I'd go live on some tropical island and forget about the tower."

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Have you driven a Ford...lately? Ford

By Jim Doherty

Modelers, too, work on the railroad all the livelong day

And sometimes all the livelong night. These perfectionists are obsessed with building mind-boggling train layouts that look real

A mid-December cold snap has Manhattan in its grip, but inside the busy depot at Lexington Avenue and 53d Street the atmosphere is warm and downright cozy. Trains are coming and going. Businessmen are dropping by on their lunch hour to watch and dozens of bundled-up children are standing wide-eyed beside the tracks with their parents. The sounds of railroading mingle with the happy cries of the youngsters and the amplified voice of Bing Crosby crooning familiar carols in the background. Ah, yes. It's Christmastime in New York, all right.

Unfortunately the festive ambience doesn't preclude trouble on the tracks. An old steam engine that was pushing a stalled passenger train has itself become disabled and now a gleaming new subway grinds to an unscheduled stop nearby. Not to worry. An emergency crew is dispatched to sort things out and soon the trains are running smoothly again. A bystander asks the workers how they got the subway back into service so quickly. "I just pushed the wall in a little," a young man explains, tugging at the visor of his engineer's cap. "It was beginning to bulge out against the cars."

The wall, needless to say, is not real, and neither are the tracks or the trains. It's all part of a remarkable holiday exhibit at the Citicorp Center that portrays railroading in and around New York during the 1930s, the '50s and today. The vivid scenery, consisting of dioramas of mid-Manhattan, the Hudson River valley and the neighborhood around the old New York Central terminal in Weehawken, New Jersey, is rendered

Manhattan skyline, late 1930s, looms beyond trolley crossing bridge at Weehawken, New Jersey, train yard.

Neighborhood around old Weehawken terminal is part of a seasonal exhibit at Citicorp Center in New York.

Photographs by Henry Groskinsky and Michael Melford

Andy Sperandeo

Train collector Richard Kughn, owner of the Lionel Corporation, holds a diesel locomotive made by firm.

in such striking detail that the spectators can scarcely believe what they see. It contains 5,000 trees; 1,500 tiny people; 400 cars, trucks and buses; 120 buildings; and 1,000 feet of track. Threading their way across trestle bridges, up and down hills, and through tunnels in this miniaturized landscape are seven passenger and freight trains, two subways and two trolleys—vintage Lionel and American Flyers, mostly, along with some smaller-scale models. An automated lighting system creates the illusion of time passing, from sunrise through high noon on into nightfall, a 24-hour day every five minutes. All of this is happening inside a 32-foot-high Victorian structure called Citibank Station that looks like a typical New York State depot around the turn of the century.

The effect is spellbinding. When a tall woman wrapped in furs tries to coax her pigtailed little girl toward the exit, the child frowns and stamps her feet. "I don't *want* to go yet," she protests, "I don't *want* to go yet." They don't go. Nobody else seems to be in a hurry to leave, either. The line of people waiting to get in at the red crossing-signal light is beginning to wind down the hallway and out of sight beyond the elevators. "Looks like another one of those days," sighs an attendant.

Harking back to the heydays

It probably is. When Citibank opened its annual display to the public for the first time last year, it was expecting 25,000, maybe 30,000, visitors. By the time the exhibit closed four weeks later, nearly 125,000 had filed past the crossing signal. Now that word has gotten around, even more are likely to drop in this year. People, it seems, are falling in love with trains again.

In a way, visiting Citibank Station is a throwback to the 1930s and '40s, the halcyon years of toy railroading—and real railroading, too, for that matter. Those were the days when every aspiring young engineer wanted a train for Christmas, and no New York holiday season was complete without a trip downtown to see the spectacular American Flyer exhibit in the A.C. Gilbert Company's Hall of Science on Fifth Avenue at 23d Street or the original Lionel showroom at that company's old headquarters building on East 26th Street. In the early 1950s, Americans were buying around a million train sets a year and the joke was that although fathers supposedly made the purchases for their sons, it was usually the old man who ended up taking over as chief dispatcher, conductor and engineer.

Today it's no joke. Playing with trains has become a serious pastime for several hundred thousand adults, more than a few of whom are obsessed with their hobby to the exclusion of just about everything else. ("Pray for me," pleads a bumper sticker, "my husband's a

Famed Texas modeler Malcolm Furlow perches in foggy gorge of his first layout, a Colorado silver town. Tunnel at right is entrance to the mine. Trains haul ore across bridge behind Furlow to reduction mill (left).

train collector.") Dad doesn't even bother to pretend anymore. Hey. The trains are *his* now.

Sidetracked for years by slot cars, electronic games and a succession of other fads, trains are making a comeback. During the past three years, the revitalized Lionel Corporation, now located in Mt. Clemens, Michigan, doubled its business and, overall, sales of toy trains in this country are running in excess of a million sets annually. Even so, the kiddie scene is not where the action is. In 1987, hobbyists spent more than $180 million on trains and related products, compared to $133 million five years ago.

Largely unnoticed by the general populace, an entire subculture of railroading enthusiasts has come of age during the past several decades. Its members range from the traditional buffs, called "rail fans," who enjoy watching real trains, to people who acquire and recondition old railroad cars and locomotives; from collectors of toy (or "tinplate") trains and scale models (which are not considered "toys") to builders of backyard steam locomotives and the fanatics known as modelers—technical wizards who spend years creating elaborate layouts upon which to operate their trains. Another whole category of enthusiasts, called "armchair railroaders," covers people who are content to stay home and read about what everyone else is doing. Even yuppies are getting into the act. Lionel is producing a new line of hefty trains to appeal specifically to them, especially a cute 19th-century woodburner called the Gold Rush Special.

Most train hobbyists are interested in authenticity, not cuteness. They research such esoterica as Minnesota logging railroads and the great train stations of Europe. They study the history of such obscure and defunct lines (referred to as "fallen flags") as the Lehigh Valley and the New York, Ontario & Western. They want to know where particular trains went and what kind of equipment they had. They browse through

Board Editor Jim Doherty once worked as a brakeman for the Chicago & North Western Railway. He still has the train set that was a Christmas present in 1946.

field guides, not unlike those carried around by birders, in order to identify trains or check their features and markings. They watch videotapes of famous trains, like the Union Pacific's Overland Limited, pulling into stations, switching cars and highballing down the line. They buy other tapes (at $29.95 and up) that feature astonishing layouts by renowned modelers Malcolm Furlow, John Olson and others. They subscribe to such magazines as *Model Railroader* (circulation nearly 200,000) and *Classic Toy Trains,* a new publication for collectors that sold out all 35,000 copies of its premiere issue last year. They join organizations like the National Model Railroad Association and the Train Collectors Association, the Ontario and Western Railway Historical Society and the New York Society of Model Engineers. They travel to conventions and meetings.

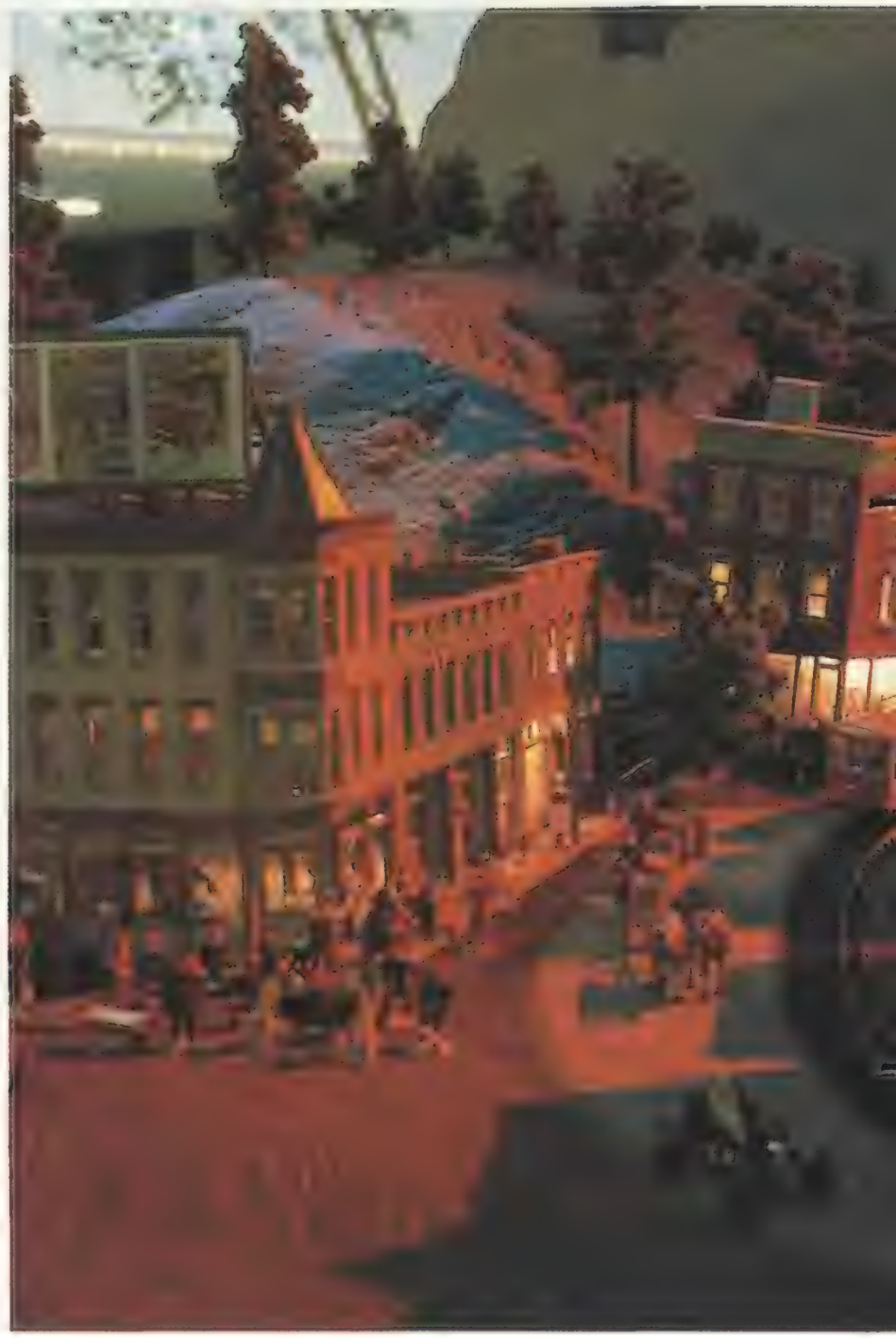
"The biggest thing we ever get close to"

What's behind all this? Nostalgia and the romance of railroading, for one thing. Fascination with trains and the complexities of operating them, for another. "Trains are the biggest thing there is that most of us ever get close to," says John Armstrong, a longtime modeler and nationally known layout-design expert who lives in Silver Spring, Maryland. "And yet, as big as they are, you can have the satisfaction of running a railroad, or an entire system of railroads, right in your own home. You can buy or make realistic scale models of the specific trains you want. You can make mountains and rivers and cities in the same scale as your trains. You can have sophisticated sound systems and incorporate computerized commands into your electronic control system. You couldn't do this with an airline or a ship line but you can do it with a railroad."

Most modelers are also collectors but many collectors don't model. Some modelers enjoy making scenery but aren't particularly interested in running their trains. Some hobbyists love to wire up their layouts and get their trains going, but they don't have the inclination or patience to build scenery. All collectors and modelers are rail fans but most would probably continue their hobby, says Russ Larson, the editor of *Model Railroader,* even if real trains (called "prototypes" by modelers) disappeared altogether.

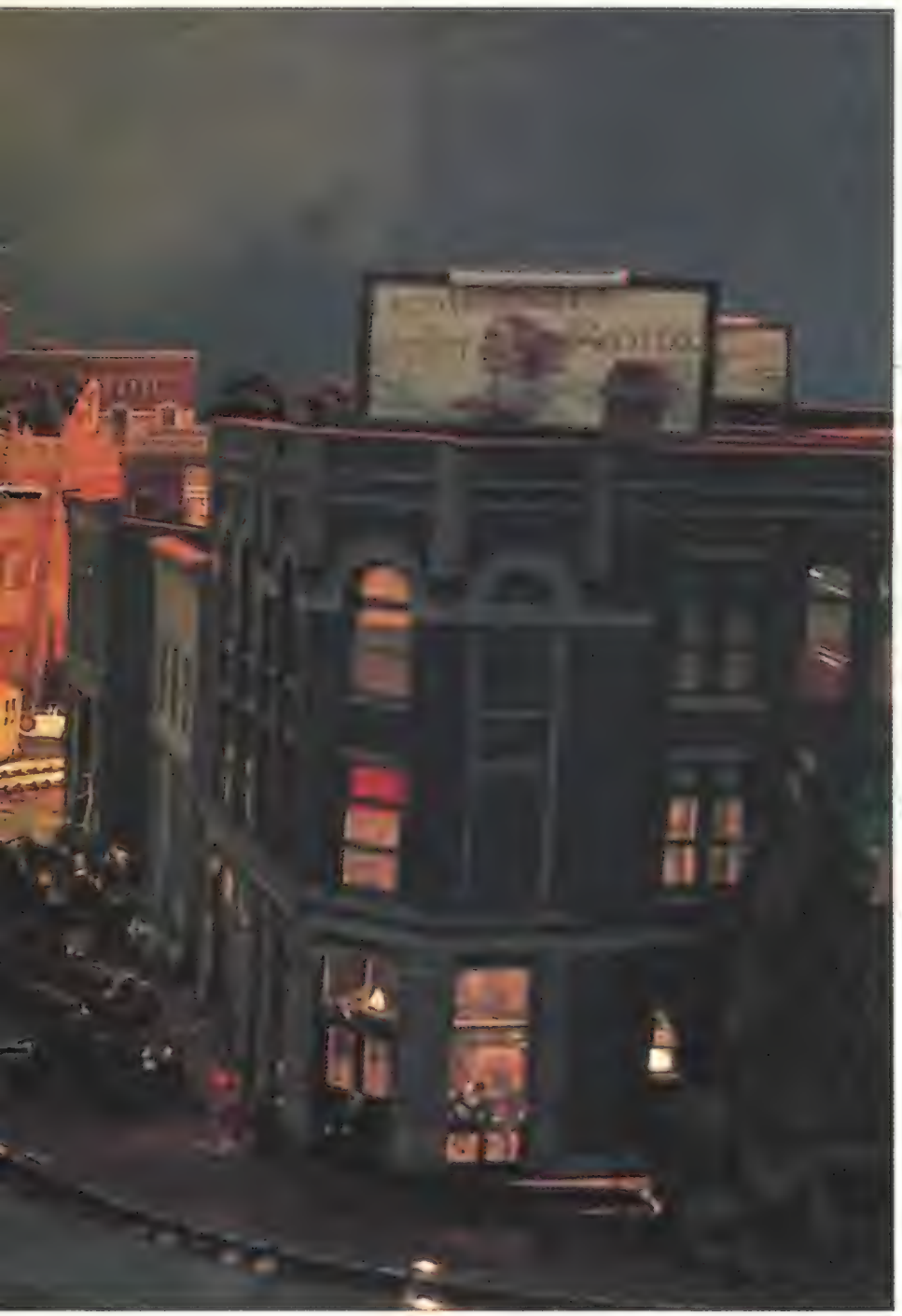
Many collectors acquire complete sets of old trains but some concentrate specifically on locomotives, trolley cars or cabooses. Others focus on certain kinds of equipment—streamlined passenger trains of the 1940s, for example, or steam-powered freight equipment of a certain size (scale) or era, or trains and accessories made by a particular manufacturer.

One of the most impressive private collections in the country is housed in a remodeled bowling alley on the west side of Detroit. There, owner Richard Kughn has



Traffic is heavy on street in downtown Weehawken as trolley rounds bend. The vivid scene is set in 1937.

In Dean Freytag's South Ridge Lines layout, hoppers filled with iron ore pass a steel company's engine house.



Creator Clarke Dunham paved the dirt (foreground) with brick before Citibank Station opened last year.

Silver Zephyr passes a ski train stopped at station in Winter Park, Colorado, layout done by Brian Holtz.

thousands of trains on display, including some of the most coveted of all: Lionel's Blue Comet and American Flyer's President's Special, both passenger trains, and a black-and-orange Ives train known as the "pumpkin set." He also owns the private business car that once belonged to Henry Ford and a reconditioned T1-Class Reading Railroad steam locomotive.

Collectors love the bartering that takes place at dozens of swap meets held all over the country each year, including two mammoth events in York, Pennsylvania, that draw 10,000 people on a weekend. Anyone who is prepared to pay cash rather than trade for what he or she wants had better have deep pockets—a rare trolley in mint condition can go for as much as $25,000—and some collectors do. Richard Kughn, for example, is a real estate magnate who augmented his train collection three years ago with the purchase of the Lionel Corporation.

Most modelers are middle-aged, middle-class men: ordinary guys who spend an extraordinary amount of time in the basement, which is where their workbenches, layouts and trains are. (More than one modeler purchased his house because it had a "railroad basement": good size, no outside entrance, steps in the middle and nothing else a layout would have to contend with except a furnace.) These people are handy, fussy and crazy about details; many are also quite artistic. Clarke Dunham, the creator of Citibank Station, is a veteran theatrical designer who has produced the scenery for many Broadway shows, including *Bubbling Brown Sugar* and *The Me Nobody Knows.* For him, modeling is a means of self-expression, but he also likes to run his trains. "I get a big kick out of it," he says. "Why can't I be 10 years old once in a while if I feel like it?"

Frank Sinatra likes to be 10 years old once in a while, too. The sophisticated Lionel layout at the singer's California home features a "neighborhood" reminiscent of the one in Hoboken, New Jersey, where he grew up. It was built for him by a hobby-shop owner.

Collecting toy trains of the past

Walt Disney was a great fancier of scale-model trains and so is Ward Kimball, who won two Academy Awards as one of Disney's animation supervisors and producer-directors. Documenting the history of toy trains from 1870 to 1940, Kimball's superb collection is displayed in a large building behind his house in San Gabriel, California.

Although there's no fine line separating different kinds of hobbyists, some modelers—perhaps because they see themselves as bold creators of brave new worlds—seem to take special pleasure in kidding the others. Collectors, they say, are "speculators" who deal

Bright color, elaborate detail make the 381E Olympian one of the fanciest locomotives Lionel ever produced.

in cash, not railroading. "They're like stamp collectors," sniffs John Armstrong. "They want to know: Does it come in its original box? That's the kind of thing they like." Diehard rail fans, unlike modelers, he jokes, have little control over their own destiny: "They arrive just after the last train left and they give up just before the next one arrives." The "live steamers" who build small steam locomotives that operate outdoors are dismissed as "machinists." Modelers can be pretty hard on themselves, too. "We're all a little weird," Armstrong admits, "but the neurotics among us are the weirdest of all. They're the ones who try to get every detail right, and they aren't satisfied until their trains and layouts have reached perfection. Since that's impossible, they're never satisfied. I'm pretty fussy myself but I'm not a nut about it."

Back in January 1934, when the first issue of *Model Railroader* was published by a young Milwaukee printer and hobbyist named Al Kalmbach, there were only a few thousand modelers in the entire country. Toys dominated the field—mainly the snazzy streamliners and muscular freight trains produced by American Flyer and Lionel, together with several popular lines from abroad. However, enthusiasm for more-exactly scaled model trains was growing. Indeed, ever since the first wooden, cast-iron and stamped-tin "floor trains" were introduced in the mid-19th century, the pressure for realism had been building. Eventually manufacturers responded with die-cast locomotives, more-authentic-looking cars, better duplication of railroad logos and markings. But not even the advent of electric power, remote control, and entire train systems with track switches and a bewildering variety of accessories could alter the fact that the trains themselves still ran and looked like toys. Consequently, some hobbyists began modifying their tinplate equipment to make it look more realistic and they started building their own scale models from scratch.

The advent of miniature scale

Before World War II, the giant German toy firm Märklin began marketing a line of small, precision-scale trains that proved extremely popular. Other European and American manufacturers followed suit with their own versions in the size that would soon become known as HO scale. After the war, however, both Lionel and American Flyer experienced such a strong demand for their larger trains that they neglected to follow through on their earlier initiatives. By the time the postwar boom began to peter out in the mid-1950s, other firms had ushered in the era of miniature scale. The two American giants, caught napping by declining sales of their traditional train sets, ended up in big trouble.

A quartet of engines shows big differences in size. At top, Lionel's famous 1940 New York Central Hudson locomotive. At left, Pennsy Railroad engine in tiny N scale. At right, HO scale Rio Grande locomotive, by Rivarossi. Bottom, Lionel model 400E, built in 1930s.

Scale modeling, meanwhile, had taken off like the Twentieth Century Limited. Thousands of returning servicemen got interested in it. Hundreds of new hobby shops and specialty manufacturers appeared all over the country. Whereas the early practitioners made almost everything from scratch, now train kits, power packs, flexible track, and hundreds of parts and components were available. But when HO and the other ready-made miniature models came along, together with superb brass locomotives manufactured in Japan, many hobbyists began shifting their attention from equipment to scenery and structures.

The smaller trains meant that more track and scaled-down scenery could be laid out in a limited amount of space. It was the beginning of a transition beyond purely mechanical concerns to an appreciation of the worlds within which railroads operated. The best modelers became architects and, in the process of creating their painstakingly detailed work, many of them revealed themselves to be keen and bemused observers of the American scene.

One of the most influential pioneers in the field was a droll, chubby bachelor and onetime studio photographer named John Allen. Also known to his friends and admirers as "The Great Pooh-Bah," Allen lived frugally on his savings and a modest inheritance in a small redwood house perched on a hillside overlooking Monterey, California, the town John Steinbeck made famous in *Cannery Row*. In the basement of that home he began building a 24-by-32-foot mountain railroad that became perhaps the best-known layout of all time. Called the Gorre & Daphetid (GD) line—pronounced "gory and defeated"—it was the subject, from the 1950s through the early '70s, of numerous articles in hobbyist magazines featuring exceptionally realistic photographs taken by Allen himself.

Most readers of those articles had never seen anything like the GD. Allen based it on an imaginative Western scenario complete with mergers, swindles and depressions. It was a gritty, hard-pressed operation that hauled freight and passengers from the city of Great Divide across two towering mountain ranges to the town of Gorre, passing through small villages and the sprawling city of Port along the way. It had a four-tier main line, branch lines, a trolley line, sidetracks, switching yards and stockyards. It incorporated 130 bridges of one sort or another, including an elaborate trestle structure that stood fully five feet high. The GD was, in short, a modeling tour de force.

On Tuesday evenings, Allen enjoyed operating the GD with a group of companions who were divided up into crews. Each crew was assigned a train and an operating schedule, and Allen expected everyone to take the work seriously. The trains were run in scale time following the same rules and procedures real trains must follow, right down to such picky matters as

Text continues on page 94

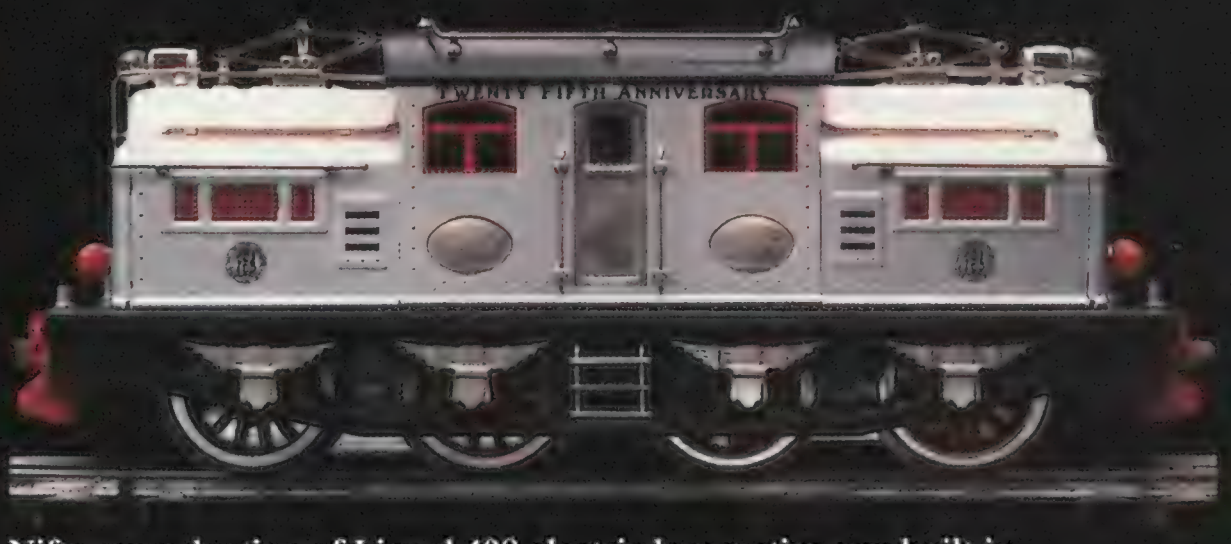
The shiny souvenirs of a bygone era, classic toy trains are as stirring as their husky prototypes

Wings spread, an eagle gives a vigilant look to front of American Flyer's 1920s President's Special.

Lionel engine 402's door, steps show immaculate detailing of 1930s.

The largest steam locomotive ever made by Lionel, 400E pulled the legendary Blue Comet passenger train.

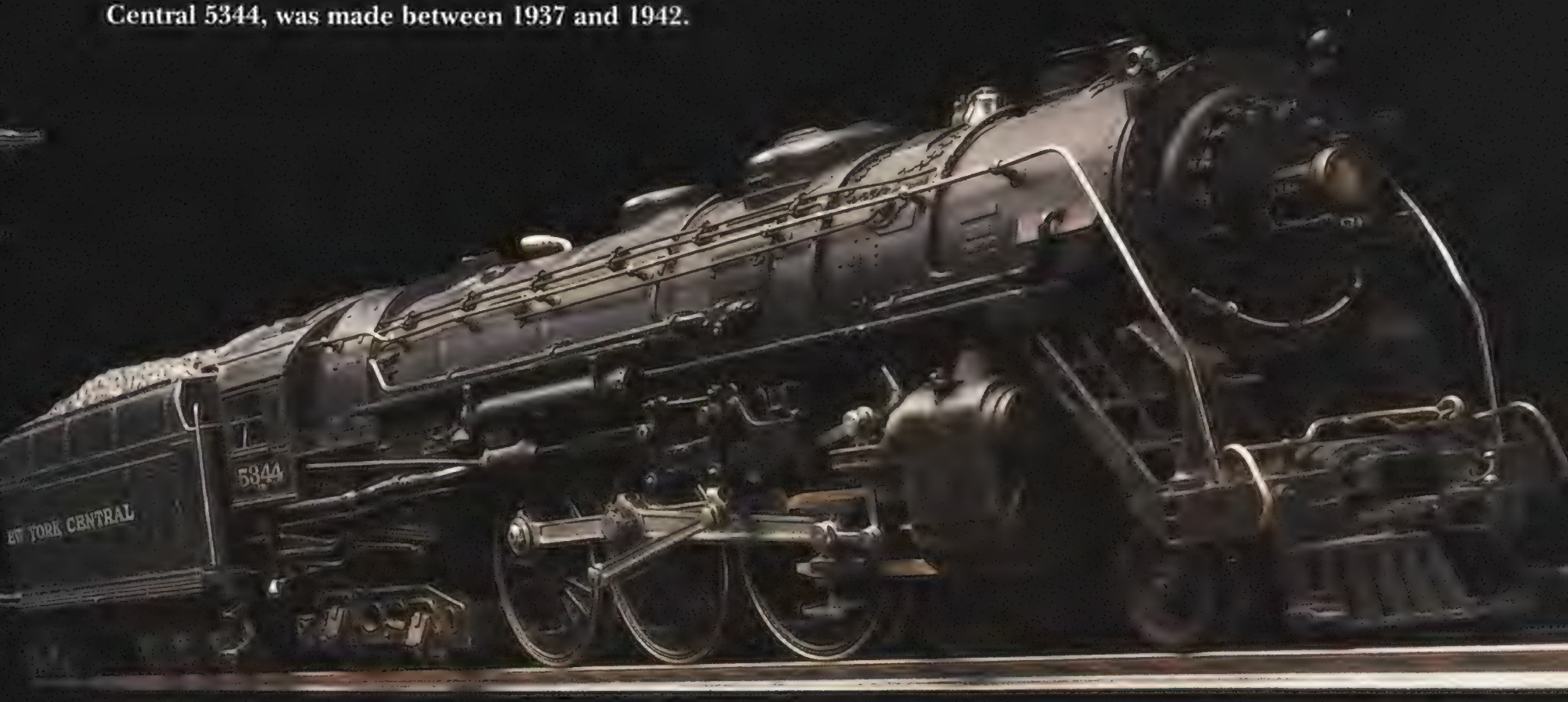
Wheel and rod assembly on Lionel 400E engine simulated steam-driven power.



Nifty reproduction of Lionel 408 electric locomotive was built in 1979 for the silver anniversary of the Train Collectors Association.

Ives 1134 locomotive and tender from the famous National Limited set were made in 1930.

Lionel's sensational Hudson locomotive, New York Central 5344, was made between 1937 and 1942.



Bruce Chubb points to some of the electronic cards that tie his very sophisticated railroad into a computer.

who controls train movements within yard limits. It was railroading by the book—but not without some comic relief. Allen used a laugh box hidden under the layout to bedevil his companions at critical moments, and once he secretly mounted magnets inside two freight cars, making it impossible to couple them.

Allen was 59 when he suffered a fatal heart attack early in 1973. He had been pushing himself hard to complete the GD's main line but was feeling weak and tired. Perhaps he had a premonition of death. "Don't know what to do with the house and railroad," he confided to a friend one day. Shortly after he died, a fire gutted his house and ruined the railroad it had taken him almost 20 years to build.

The tradition Allen established—authentic, original modeling on a mind-boggling scale—is still going full steam ahead. One of the leading practitioners today is Malcolm Furlow, a genial Texan who has been modeling for only six years but has created such a stir with his offbeat style that he now does layouts and elaborate scenes for train manufacturers and other clients. A former rock musician and motorcycle racer, Furlow describes himself as a "dioramicist" and an "illusionist." He specializes in dusty Western settings with sheer cliffs and run-down towns. He likes beat-up storefronts, dilapidated cars and trucks, clutter. He's a stickler for detail, right down to the rust on his water tanks and the foot irons, insulators and tattered posters on his telephone poles, but his signature, as an artist, is his sardonic eye and his funky texture. Furlow has been described as "the Red Grooms of modeling" because of his talent for caricature and exaggeration.

Some old-timers damn with faint praise the iconoclastic work of Furlow, John Olson and other contemporary modelers; they label it "quaint." Clarke Dunham, on the other hand, is impressed by what he calls their "incredible panache." The most successful modeler, he says, is not the guy who gets every rivet right. "It's the guy who starts out with a unifying concept, a theme or maybe just a feeling of nostalgia for a certain time and place. The true artist puts his trains, scenery, track plan and wiring together in a way that conveys not just physical reality but an atmosphere as well."

A mania for miniaturized minutiae

One thing modelers share is a passion for minutiae. When it comes to building equipment and scenery, the little things don't just mean a lot; they mean everything. In the old days, hobbyists had to make their own; now, you can buy just about anything you need, ready-made and in quantity. Each year, William K. Walthers Inc., a Milwaukee company that manufactures and distributes model railroad supplies, publishes a fascinating HO scale catalog that is to hobbyists what the annual compendium on baseball statistics by Bill James has become to fans of the national pastime. The 1988 edition runs 760 pages and lists 50,000 railroad items made by more than 300 firms, some of which, like Walthers (with 130 employees) and Lionel (with nearly 400), are quite large, but most of which are as tiny as the things they produce.

In this modeler's bible you can find miniature Coca-Cola machines (upright or open-top), garbage cans (20- and 30-gallon sizes), auto tires (assorted sizes), piles of railroad ties and 200-gallon fuel tanks with stands. You can find freight-car air hoses, bells for diesel engines and steam locomotives, observation-car platform railings and caboose cupolas. You can find tombstones (in case you want to build a cemetery), fuzz (for grass, bushes), trestles (for bridges), plastic landscape material (for mountains). You can order baggage carts, crossing signals, stations, benches, clocks. Not to mention run-down beehive coke ovens, assorted trackside junk, jugs, lightning rods and five-gallon cans.

Although HO is by far the most popular modeling

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Modeler Bruce Williams Zaccagnino puts crane car on five-foot-tall bridge built with 7,000 pieces of wood.

scale among railroaders, other scales range from the minuscule Z on up to the comparatively gigantic G. You could, if you wished, build a Z-scale railroad on the brim of a straw hat. ("The damned thing is so small," grumps one unimpressed O scale man, "that when you get close enough to take a good look, your nose knocks it off the track.") Or you can go for size. For the past 16 years, Bruce Williams Zaccagnino (above) of Three Bridges, New Jersey, has been beavering away at what he calls "the world's largest model railroad." It occupies a space in his basement about 45 feet wide and 270 feet long. It contains 2.5 miles of track, more than 1,000 switches, 400 bridges and 37 tons of plastic rock. Since selling his hobby shop a while back, Zaccagnino, who is in his early 40s, has worked nearly every day on his layout, often putting in 14 or 15 hours at a time. "I love it and I'll probably keep doing it until the day I die," he says. "Michelangelo never finished with his art and I won't either."

Each fall the enthusiastic modeler opens his HO scale extravaganza to the public for a couple of weekends, with the proceeds from ticket sales going to benefit the local fire department. On a Sunday afternoon early last October, nearly 1,000 people trooped on and off the school bus that was being used to shuttle tourists between the parking lot of a local bank and Zaccagnino's rural home. Some folks seemed a bit disappointed at first. Zaccagnino's basement *looks* like a basement and several sections of his layout are a little rough around the edges. But as the visitors progressed from room to room, many expressed amazement. "I never saw anything like this before," said a woman from Philadelphia.

Stationed at intervals along the outside of the display and squatting like gnomes beside the mountains in the middle of it, several dozen men kept 60 or 70 trains running while Zaccagnino dashed about keeping an eye on things and greeting people. One of his helpers, John Jessiman, was operating a Lehigh Valley freight train when Erwin Schaff came along to relieve him. "How do you like the show?" Schaff asked a passer-by. Then he said: "Thank you very much for coming."

Monitoring trains with a computer

If high tech is what interests you, model railroading is a good vehicle for that, too. Bruce Chubb, a Grand Rapids, Michigan, electrical engineer who is president of the Research and Technology Institute of Western Michigan, has spent more than 34 years developing one of the most sophisticated layouts in the country. His Sunset Valley Railroad operates with the help of a computer that coordinates signals, keeps 16 trains going simultaneously, prints out car-switching lists, and monitors the movements of individual trains and cars. During operating sessions, Chubb sits at his five-foot-long control panel and supervises his crews with the assistance of the computer, an electronic map and telephone hookups.

What's next? Well, this winter Lionel is introducing a video innovation. It's a tiny camera, implanted in the front end of a locomotive, that relays an image to the screen of a television set. With the set located next to the layout, the railroader can operate his trains and enjoy an engineer's view of the scenery up ahead.

Maybe it's the fulfillment of many hobbyists' dreams, but the idea of looking at television instead of at the train and the layout will strike at least a few traditionalists as a step in the wrong direction—the technological equivalent, if you will, of a derailment. Years ago, long before this fancy stuff started coming down the pike, all any kid really needed was a train, enough track to make a loop or two, maybe a couple of switches, a bridge and a few buildings. He (or for that matter, she) would break the thing out on a snowy afternoon

along about Christmastime, set it up on top of the Ping-Pong table downstairs and turn on the transformer. Off the locomotive would go, steaming up the straight track, careening around the bend, clattering over the bridge with a coal car, a boxcar, a tank car and a red caboose rattling along behind. The boy would get his face down close to the engine each time it passed, and pretend he was sitting in the cab. Then suddenly he would find himself being transported through the infinitely varied landscape of his own imagination, a perfect world of gentle valleys, peaceful farms and sleepy villages with streetlights glowing, a landscape in which his train chuffed around gleaming mountains and sparkling lakes until finally it pierced the heart of a great American city where there was serious work to be done—cars to be switched, crews to be changed, new orders to be received. What do you suppose the chances are of making a journey like that on television?

Freight train approaches a double-track, steel-arch bridge on Zaccagnino's sprawling layout. Epitomizing modelers' zeal, the New Jersey enthusiast has spent many years making his railroad—and he's not done yet.

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Let's get it together. buckle up GM

By Donald Dale Jackson

Up in the 'cold lab' human guinea pigs shiver for science

By exposing volunteers to chilly air and water, researchers at the Hypothermia Laboratory in Duluth study how people respond to cold

Roger Hynes, a third-year medical student at the University of Minnesota—Duluth, sounds confident if not nonchalant about the ordeal he has volunteered to undergo. "I'm not worried," he insists. "I'm going to think of myself as a pilot who has to ditch in the ocean." But his eyes keep straying to the tank of water, a chilly 50 degrees F, where he will spend the next half-hour as a human guinea pig for scientists studying how extreme cold affects our bodies and our ability to function. Finally, he steps to the edge of the tank and dips a foot in the water. "Now, why'd you want to do that?" technician Bob Dromeshauser asks good-naturedly. Roger's face remains a noncommittal mask.

Robert Pozos suddenly bursts into the room and climbs to the rim of the four-foot-deep fiberglass tank. Pozos, a physiologist who founded the Hypothermia Laboratory at the medical school ten years ago, is a garrulous, animated man who doesn't permit scientific detachment to inhibit his effervescence. Nodding at the technicians who are ready to monitor Roger's heart and respiratory rates, along with his "core" temperature and that of his skin, Pozos puts a hand on the young man's shoulder and says, "All right, let's do it."

Clad in a T-shirt, shorts, sweatsocks and a life jacket, Roger eases into the tank, gasps reflexively, and leans back with his knees bent and his feet on the bottom. "Profanity is allowed," Pozos says helpfully. "And remember that you can get out whenever you want to. How about your glasses, want to keep them on?" "Yes," Roger replies soberly. "If I panic I want to be able to see."

The purpose of this particular test is to gather data on how a person in street clothes responds physiologically to immersion in 50-degree water. The Duluth scientists compare this data with similar readings for volunteers in survival gear. The goal is the development of outerwear that will protect from hypothermia downed pilots and others who are rudely dumped into icy waters. Hypothermia is the chilling of the bloodstream and vital organs that can eventually result in death by cardiac arrest. It begins when the temperature of the core organs—the brain, heart, lungs, spine and intestines—drops from the normal 98.6 degrees F or so, to around 95.

The charter of the Duluth lab, Pozos says, is "to study how we respond to cold, across the board." Operating in a cramped basement room, researchers gather information continuously on the relation between age, body type and susceptibility to cold. This data is of interest to the armed services, diving firms and commercial fisheries, in addition to cold-weather clothing manufacturers.

Experiments conducted in the cold-water tank and in a nearby, cell-size "shiver chamber" have resulted in both improved equipment and a better understanding of the danger of cold, which is often exaggerated. Lorentz Wittmers, who took over as director of the lab with Pozos' departure last month for a new position at the University of Washington, points out that research there has dispelled the conventional wisdom that a plunge into Lake Superior is fatal within ten minutes. "People wouldn't wear a life jacket because they figured they wouldn't last anyway," Wittmers says. "We've shown that you can survive in cold water a lot longer than you might think."

The first reaction to cold stress

Roger Hynes is surviving reasonably well after three minutes in the tank. His core temperature is unchanged, though sensors on his skin show that his extremities are now approaching the same temperature as the water. "That's the body's first reaction to cold stress," Pozos says. He explains that the blood vessels near the skin constrict with the first frigid shock, permitting the flesh and extremities to cool while an increased flow of warm blood is routed to the internal organs that need it. One's core temperature normally holds steady in cold water for 10 to 15 minutes before it starts to fall. Volunteers at the Duluth lab come out

Medical student Matt Harrison trembles in frigid water while wires monitor his temperature and heart rate.

Photographs by Peter Menzel

The lab where everything is cool

Hypothermia expert Robert Pozos takes a break from serious research to spoof his nickname, "Dr. Icebox."

of the tank when their core reading drops 3 degrees F or when it begins to fall too rapidly.

Pozos peppers Roger with questions as a way of tracking his mental state, but the conversation turns ragged when Roger begins shivering after five minutes. "I think—I want to—just drift—and say—whatever comes up," Roger stammers. Shivering generates body heat through muscle contractions and friction, and in cold air it's a plus. But in the water, Pozos says, shivering is a mixed blessing at best, because the additional splashing it causes drains away more body warmth than it produces. Cold water is more dangerous than cold air because water conducts heat away from the body perhaps 25 times more efficiently than air does.

"I want to try something, Rog," Pozos says. "I want you to add 45 and 72." "Oh God," Roger moans. "Wait—uh, 117." "Now add 63." "Ah—180." "Divide by four." Roger knits his brow and frowns, but he's not shivering. "Forty-five," he says. "We've found that mental concentration halts shivering," Pozos points out. "That means there's a connection between the cerebral cortex in the brain and shivering, but we don't know what or where the connection is."

When Pozos asks how he feels a few minutes later, Roger answers "Not bad," but he's unconvincing. He is shivering violently about every ten seconds now and he's in pain, though numbness is not far off. "Pain is preferable to numbness in the cold," says Pozos. "The pain receptors—nerve endings—are the body's early warning system. When you become numb you relax and you don't receive the signals your body's sending you. That's when you get in trouble." Roger is still receiving pain signals. "He's dropping a tenth of a degree every three minutes," a technician reports.

Warming up to a cold subject

Pozos has established himself as a leading American authority on hypothermia. Most other "cold labs" in the United States use animals and focus on biochemical questions about how the body regulates heat, but the Duluth scientists deliberately set out to study all aspects of the human response to cold. Pozos, Wittmers and the third member of the Duluth team, clinical psychologist Richard Hoffman, have noticed that cold research has recently been riding a modest wave of popularity. Speaking invitations have increased along with talk-show appearances and news stories, especially whenever a cold-country child survives a half-hour on the bottom of an icy stream. "People ask how the kids can survive, about rewarming techniques and about the effect of cold on the homeless," Pozos says. "Maybe the subject's been rediscovered, or maybe it's because there's more interest these days in old people, who often have problems with the cold."

During study of cold's effect on the vascular system, gloves protect electrodes (not visible here) from water.

Cheryl Klenow wears mittens for her stint in shiver chamber, where the temperature is about 30 degrees F.

Roger's ordeal has gone on for 25 minutes now, and he's numb. His eyes look cloudy and his responses are noticeably slower. His core temperature is dropping even faster than before. "I feel—best—when I don't—think," he says between shudders, and at 29 minutes Pozos decides to take him out. (Most subjects stay in for 45 minutes to an hour.) Roger shakes wildly as he strips off his shirt, dons a dry robe and takes a cup of hot chocolate in both hands. "This is—the worst of it—right now," he says as he walks doggedly back and forth, detouring around technicians. "I feel—the heat—just leaking out—of me." His core temperature continues to dive for 15 minutes and finally bottoms out more than 2 degrees below the reading before he went in. This "afterdrop"—a plunge driven by momentum—is especially dangerous because people don't expect it.

"This is the most worrisome time," Pozos says. "Your core keeps dropping and you don't warm up that fast. People sometimes hallucinate at this point." Rewarming is also tricky. If it's done too fast, a person can temporarily lose consciousness as his peripheral vessels dilate and his blood pressure falls. The Duluth volunteers (mostly medical students) are urged to walk and to drink hot fluids, but cautioned not to take a hot bath or shower until about a half-hour after emerging from the tank, when the core temperature is on the rise. "I like that idea," Roger says earnestly when Pozos asks if he's ready for a shower. Even after the shower, Roger is still cold. His eyes remain hazy and his legs are weak. He is still shivering, but less often and less intensely. "I'd do it again," he avows, upbeat to the end. "I mean it was, uh, sort of, uh, invigorating."

Pozos is the only Southern California Hispanic (both his parents were born in Mexico) who gets letters addressed to "Dr. Icebox, Duluth, Minnesota." He has traveled a roundabout route. After college in California and graduate school in Illinois, he became interested in the physiological mechanics of shaking while working with patients who had Parkinson's disease. Moving to Duluth, where the average January temperature is 6 degrees F, gave him a closeup look at another poorly understood tremor, shivering.

Lake Superior, the source of the water in the hypothermia lab's tank, normally stays between 40 and 50 degrees F year-round. Though the scientists work primarily indoors—Pozos prefers the greater control the tank affords—they occasionally drop a volunteer into the lake. Dave Israel, a cross-country skier and graduate physiologist who works as a technician at the lab, plunged into the lake in street clothes three years ago. Wearing a life jacket and tethered to a boat, Israel stayed in for 30 minutes while his core temperature plunged 3 degrees. "When I first went in, every square inch of my body stung," he recalls. But it is the deep core cold he remembers most vividly. "I shivered for six hours after I got out."

When Pozos launched the hypothermia lab in 1978, he knew that the most detailed studies of humans in the cold had been a series of sadistic tests by Nazi scientists at the Dachau concentration camp. Concerned about the survival rate of Luftwaffe pilots downed in the English Channel, the Nazis forced some of their

After enduring Duluth's subzero temperatures, Donald Dale Jackson was delighted to thaw out his frozen "core" back home in balmy Connecticut.

Doing research on exercise in cold water, technician Bob Dromeshauser (at left) watches psychologist Rick Hoffman monitor computer while man in tank (center) "rides" bike. Equipment to Hoffman's right monitors air the man inhales; device at left analyzes exhalations.

captive subjects to remain in icy water until their hearts gave out to learn the limits of the body's resistance to cold; they found that most could survive until their core temperature reached 77.

The Duluth researchers have developed several safeguards to protect their volunteers. A university committee on the use of human subjects in research monitors the lab's work and sets guidelines, which include the subject's right to quit when he or she feels like it without forfeiting the pay (usually $100 per test). Since the lab is in the medical school, a doctor is always handy. Volunteers are stress-tested beforehand to make sure their hearts can take the jolt of the initial dip; they must be under 35. ("My rule of thumb is, my age minus ten," Wittmers jokes.) The only problems to date have been a few volunteers who blacked out briefly while they were rewarming. "I worry about these kids like I was their mom," Pozos says.

An experiment the lab is conducting for the U.S. Coast Guard measures the combined effect of cold, fatigue and alcohol on people operating boats. The subjects are kept up all night before the test and given enough liquor to make them legally drunk. Then they're required to maneuver a boat according to specific instructions in both warm and cold weather. The results were about what you might expect: the subjects couldn't remember their instructions or maneuver the boat very well. As to the particular effects of cold weather on intoxicated boaters, the study was inconclusive and research continues.

The liquor experiments at the lab challenge a cherished cold-country axiom, the idea that drinking protects people from freezing. Alcohol can, on the contrary, be a lethal contributor to hypothermia because it sabotages the body's signaling system. "Our periphery feels warm when we drink," Pozos says. "We don't shiver, but our core temperature declines at the same rate as when we're sober. We don't realize how cold we're getting because the brain isn't getting the message. The moral: don't carouse when you're cold.

Another project is designed to find out how to give multiple sclerosis patients a good workout. People afflicted with this disease need regular exercise, but a significant rise in their body temperature usually triggers uncontrollable shaking. Exercise in cold water helps counter this tendency. Researchers at the lab are trying to pinpoint the best combination of water temperature and types of exercise.

Many of the lab's most intriguing findings have been byproducts of its military and commercial work. While testing insulated immersion-survival suits on a pair of triathlon competitors, Pozos found that highly trained athletes may actually be at a disadvantage in the cold. Fat is of course an insulator, and a cold lake or river is one of the few venues where a portly party has a survival edge, but Pozos was still surprised to discover that slim, muscular triathletes lost body heat in the water at a dangerous rate. "I think it's because they are so efficient at getting rid of heat," he says. "This hurts them in cold water—they lose core heat too fast. One of them got so groggy in the tank that he later didn't remember getting out." This suggests that finely tuned athletes may be more vulnerable to cold than they realize and should be on guard against it.

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Grogginess is often a symptom of hypothermia. Other signs include shivering, poor coordination, dilated pupils, confusion and slurred speech. "Someone who is becoming hypothermic looks and acts drunk," says Richard Hoffman, the psychologist who works with Pozos and Wittmers. With the onset of hypothermia, the victim often hallucinates—he hears rescuers' voices or sees mirages on a frozen meadow. Exposure victims are sometimes found naked, having shed their clothes in what appears to be a frenzy of wrongheadedness. "They seem to think they're hot," Hoffman says. "No one knows why." One theory suggests that this behavior (called paradoxical undressing) is triggered by extensive dilation of the blood vessels, which makes people feel warm even though they're not.

When shivering stops at a core temperature of about 87 to 90 degrees F (the range varies among individuals), it means that the body has exhausted its heat-generating defenses. Muscle rigidity intensifies at this point and can lead to drowning. Victims normally lose consciousness at a core temperature of about 85 degrees F.

In the final stages, a hypothermia victim appears dead although his organs are still functioning. His internal machinery has cranked down to the slowest pace it can maintain: the heart rate declines to two or three inaudible beats a minute, and pulse and respiration are often too faint to detect. Larry Wittmers has this note on his office door: "You aren't dead until you're warm and dead." A hypothermia victim should not be considered dead, in other words, unless the absence of vital signs persists after he is warmed.

Pozos believes that the most striking discovery to emerge from his research has to do with our phenomenal ability to adapt to cold. Eskimos, for example, can maintain heat in their fingers longer in cold water than the rest of us, and they need to. "We've seen a person's core temperature decline abruptly in the tank," Pozos says, "and three months later the same person goes in again and his temperature drops much more slowly. It looks like the body can change its response to cold on the basis of one experience."

Individuals vary widely in their physiological and psychological responses to cold and the pain that accompanies it. Some people—about 10 percent of the population, Pozos estimates—do not shiver. The reason is unknown. (Cold researchers call nonshiverers "lizards.") Two volunteers of the same age and body type can cool at dramatically different rates. Fatigue, which lowers resistance to cold, can be a factor. So can proper nutrition, which strengthens resistance. Polar explorers—a few of whom have been tested at the lab—simply ignore the cold. "They feel it, they just don't pay much attention to it," Hoffman says. One Minnesotan who has spent a lot of time in the Arctic, Arthur Oufderheide, told Pozos that in his opinion shivering is a "laboratory artifact."

Dromeshauser (left) watches for effects of alcohol, fatigue and cold on Brad Ingersoll's motorboat driving.

Can we will ourselves to live or die?

Why do some people give up and die after ten minutes in cold water while others last for hours? "I'd like to find out if there is anything physiological about the will to survive," Hoffman says. "Maybe when we give up we trigger some reaction that leads to a quicker death. We don't know where the will to survive comes from, but we know it's crucial." Pozos thinks the will to live and our metabolism may somehow be connected. "We know that the brain controls the nervous system and the nervous system runs our metabolism," he says. "The people who keep saying 'I'll make it' are the survivors. It's almost as if we can will ourselves to live—or die."

Hypothermia research sometimes leads to forays into such nonscientific realms as politics and law. Pozos believes that data on the relation of temperature and clothing to a person's vulnerability to hypothermia

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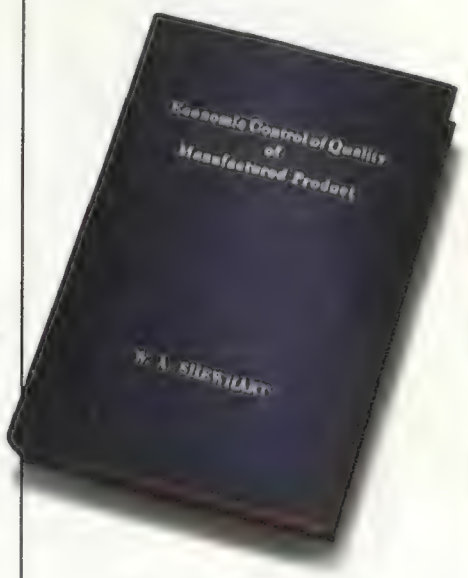

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After uncomfortable session in cold water, Brian Cress drinks hot chocolate, waits for warm-up to begin.

might influence public policy on the homeless, for example. It is also relevant to elderly people who become chilled because their rooms are too cold; an estimated 50,000 aged Americans are hospitalized for hypothermia annually. "Most of us take temperature regulation for granted," Pozos declares, "but for the elderly and street people it's a crisis."

The Minnesota scientists have investigated the "dive reflex," a strange and little-understood phenomenon that may in some way account for the survival of some children who are submerged in cold water for a half-hour or longer. The faces of volunteers are immersed in buckets of cold water while their heart and respiratory rates are monitored. "We stop breathing reflexively when our face hits cold water," Wittmers explains. "The heart rate then goes down and blood stops flowing to the extremities." Pozos thinks the key to survival in so-called near-drowning cases is the fact that the lungs fill with cold water. As the heart continues to pump for awhile, the blood cools passing through the lungs and then chills the rest of the body. Whatever causes the system to slow down, the end result is the same. "The kids survive," Wittmers says, "because they need very little oxygen."

The shiver chamber, a cold-air room where Pozos monitors the tremors of volunteers, can be cooled to a polar 30 below. A fan provides a wind chill effect. In the short run, shivering keeps the core temperature from dropping. These subjects warm up faster after their tests than water-tank volunteers because even though they spend up to three hours in the chamber, they don't get as cold. Although hypothermia is eventually just as deadly in the air, it strikes quicker in cold water. "Duck hunters who fall into the water sometimes figure if the air temperature's 20 and the water's 40, they're better off staying in," Pozos says. "Wrong, because water takes heat out of the body so much faster."

Something turns shivers on and off

Pozos' work with volunteers in the shiver chamber shows that we shudder at the same intervals all over, from chattering jaws to quivering ankles. This suggests to Pozos that we have a central oscillator, probably located in the brain, that controls shivering. "That's a new idea and it's hot stuff, if you'll pardon the pun," he allows. "What we don't know is what physiological process turns the shiver mechanism on and off."

Evidence from neurological studies suggests that cold affects the brain in particular ways. A drop in brain temperature of about 4 degrees produces hallucinations, memory loss and other signs of a decline in mental powers. But different parts of the brain may be affected at different temperatures. For example, a candidate for neurosurgery who was having a certain portion of his brain chilled described hearing himself talk and yet having the distinct impression that the words were being spoken by someone else.

Through a technique called biofeedback, scientists have demonstrated that we can consciously control processes previously considered involuntary, including blood flow and blood pressure. It is said that some Tibetan monks can dry a wet sheet draped over their bodies through what amounts to increasing their metabolic rate by sheer will. A person's survival in frigid water may result from similarly mysterious processes. "People call it magic," Pozos says. "Nobody knows how it works, but there's something out there." At the Menninger Clinic in Topeka, Kansas, a biopsychologist uses that "something" to train people to raise and lower the temperatures of their hands and feet. At a cold lab in Canada, others have been trained to raise the temperature of their hands while sitting in a cold chamber.

Conventional wisdom about cold and hypothermia, Pozos believes, is studded with old wives' tales and out-

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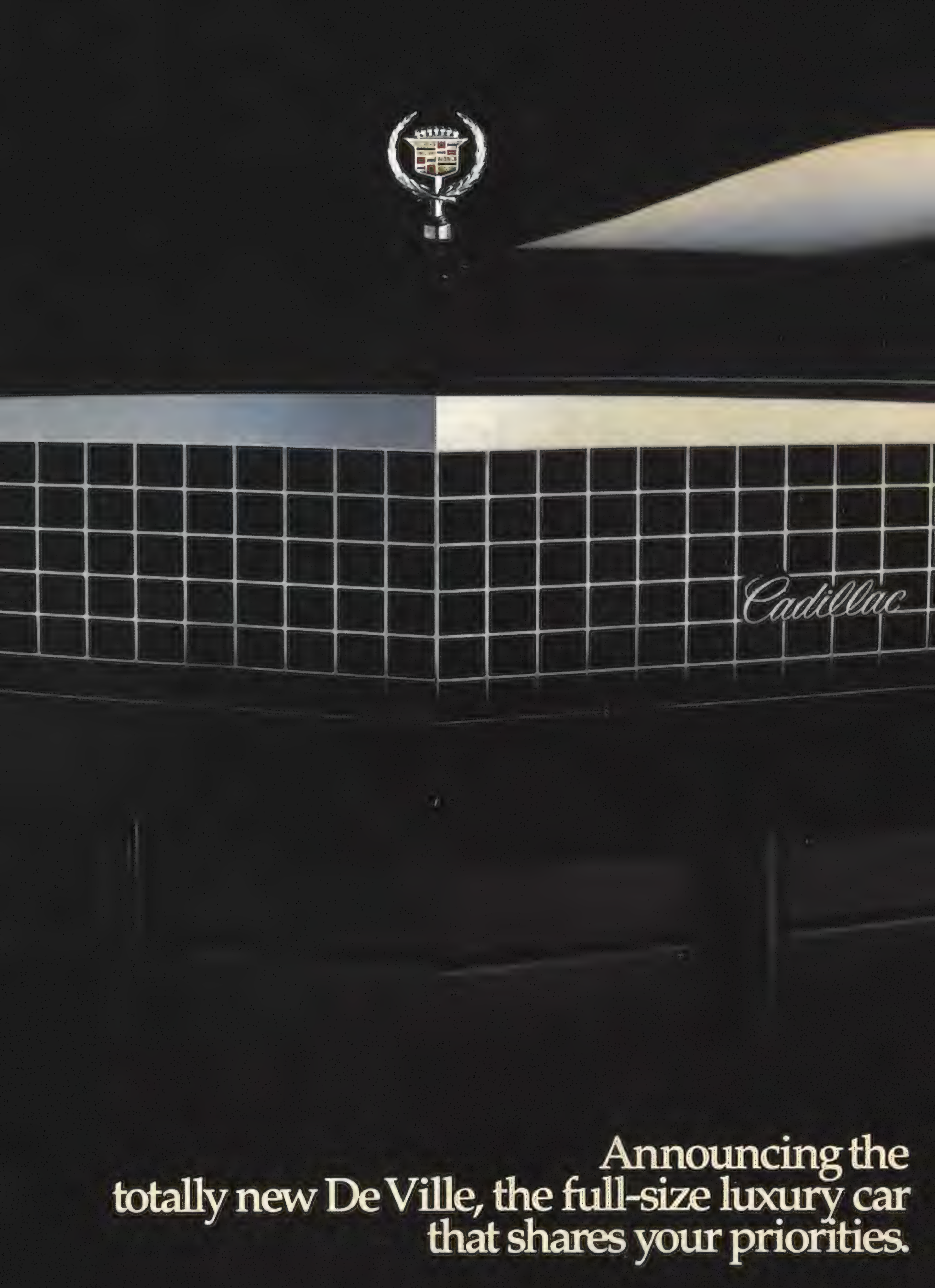
right hokum. "People don't really understand the concept of core temperature, that the core can be warm even when the skin's cold. You really *can* have cold hands and a warm heart. They think shivering is bad and if you stop you're OK, when just the opposite is usually true. They think that liquor and a campfire are the way to get warm, and it's really hot fluids and exercise."

Pozos has a few survival tips. If you're in cold water, try not to move too much (movement accelerates heat loss), don't swim (you're wearing a life jacket, of course) and do bend your body into a ball if you can. If you're lost in the woods, stay out of the wind, make a conscious effort to keep moving (but avoid perspiring), don't eat snow (it causes heat loss), and keep your clothes dry. Build a snow cave if you can, but remember that the temperature difference between your body and the ground determines how much heat you're losing; keep a blanket, spruce boughs or some other form of insulation between you and the cave floor. "You have to be careful but you don't have to be afraid to go out," Pozos says. "Don't be a winter widow or a winter wimp."

Following his own advice, Pozos turns out one January night in 17-below weather to watch a supremely Duluthian event—the start of the 470-mile John Beargrease dogsled race. A few hundred onlookers dressed like astronauts huzzah fitfully beneath a vast cloud formed from their collective breath. The sledders mush about in layers of fur and wool and down. They look like a platoon of Viking warriors.

One by one the dog teams charge out into the black void of the northern Minnesota night as the spectators cheer, occasionally warming their cheers with deceptive fluids. Pozos and two cohorts, one female and one male, watch the action for an hour. From time to time, Pozos inquires in a professional way about his companions' thermal well-being. Double-decked out, with everything covered save their eyes, both reply that they are fine. Pozos, however, is uncovered from neck to forehead and he is not fine. Dr. Icebox is feeling it in the cheekbones. "I think I'll go warm the car," he announces presently. "I'll never understand it," his female cohort observes. "Here's a man who's been studying hypothermia for 16 years and he refuses to wear a scarf."

U.S. Coastguardsman wears survival suit in Lake Superior. Temperature of water is about 45 degrees F. Research at lab has confirmed that such suits are now the best protection available against hypothermia.



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Bremer perches alongside his six-foot-tall praying mantis, hand-hewn from 11 varieties of polished wood.

The larger-than-life insect greets visitors inside the Wild Kingdom Pavilion at Omaha's Henry Doorly Zoo.

A sculptor shows us what makes the insects tick

Cutting and fitting rare and costly woods, Patrick Bremer shapes his outsize creations with the finesse of a naturalist-craftsman

It all began when Patrick Bremer's wife, Maureen, breezed through the door with a praying mantis nestled in her hair. Bremer adopted the insect as a pet, giving it the run of the apartment and observing its behavior with a proprietary eye. The mantis loomed large in his imagination—so large, in fact, that he conceived the notion of creating insect sculptures on a grand and arresting scale.

This fascination with what Bremer calls the "adaptive perfection" of the insect form led him to search out subjects wherever they might appear: a cricket chirping on his doorstep; a dobsonfly captured in a coffee cup, nabbed as Bremer, waiting out a traffic jam, spied his quarry alighting on a stone wall.

Haphazard though his collecting techniques might be, there's no doubt Bremer is working in a splendid tradition. Naturalist-illustrators from Audubon onward could admire his menagerie, adroitly and accurately crafted down to every last mandible and antenna, femur and crossveined wing. Invariably, his pieces originate with the artist, magnifying glass in hand, studying a preserved-in-alcohol specimen.

Bremer realized his vision extravagantly—the sculptures measure two to seven feet in length—and dispatched several of them for display at the Insect Zoo in Smithsonian's National Museum of Natural History. His creations, suspended in midair behind glass, hover with a compelling, and vaguely disquieting, presence. More than one young visitor, unnerved at the sight of a dragonfly the size of a German shepherd, has inquired, "They don't *really* get that big—do they?"

His is a painstaking enterprise, requiring a melding of traditional artisanry and high-tech craftsmanship. Each work begins as a block of wood —teak, mahogany or maple—overlaid with one drawing placed on each of three planes: top, bottom, side. Using hand implements and a battery of power tools, Bremer gives life to his precisely rendered subjects.

The exotic woods he chooses—vermilion and bubinga, cocobolo and purpleheart—are hard to come by. His search, though, is well rewarded: Bremer conveys the color patterning of an insect with inspired mimicry.

Whether conveying a mantis' predatory grace or a cricket's homely appeal, Bremer transcends entomological exactitude. "Often," he observes, "I do have a kind of 'identity' in mind. As I created *Cricket* [opposite], for instance, I wanted to call up associations with a friendly insect at the hearthside, Walt Disney and Jiminy Cricket. But as I began *Cricket hunter*, I wanted an undeniably sinister aspect to come through." Investing each piece with its own persona—brooding or sprightly, menacing or droll—the sculptor invites us to ponder the creatures and our own reactions to them.

And what other creations might we expect from his studio, a drafty 1820s barn in New Paltz, New York? Well, there's a bald-faced hornet coming next. And then, perhaps another praying mantis, this time looming ten feet tall.

Kathleen M. Burke

Cicada

Carpenter ants

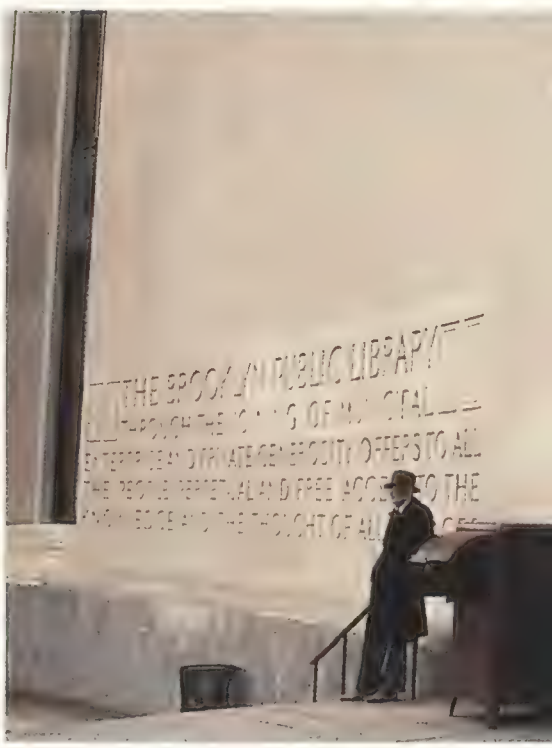
Dragonfly

Cricket hunter

Dobsonfly

Cricket

Peter B. Kaplan took Brooklyn panorama from its highest point, dome of the Williamsburg Savings Bank.



Peter Angelo Simon saw child (top) drinking from fire hydrant, evoking Brooklyn's almost bucolic charm.

Photographs by Document:Brooklyn

Another country, known as Brooklyn

A new photographic tour de force portrays the people of this mysterious region where the mother tongue is swallowed, not spoken

When Americans look for their cultural roots, most find them in foreign lands, in the homes of earlier settlers or immigrants. If you grew up in Brooklyn, as I did, you need look no further. Brooklyn is all the culture, all the identity, you could ever want. Maybe more.

The photographs of Brooklyn here and on the following pages are a fraction of 90,000 pictures taken by 46 photographers during one week in September—a project designed to "document Brooklyn." It couldn't be done, of course. Thomas Wolfe could have told them that. In his short story "Only the Dead Know Brooklyn," he wrote, "It'd take a guy a lifetime to know Brooklyn t'roo an' t'roo. An' even den, yuh wouldn't know it all." But these images do give an impression of a place where new waves of immigrants are finding their way among Wolfe's ghosts.

Is there anyone in this vast country who doesn't have some idea, some image, of Brooklyn? Maybe in the most rural Mississippi cotton fields, or the loneliest hamlet in the Ozarks? Not likely, or as we'd say in

Arlene Gottfried trained her camera on a scene from her childhood, the haven of Brooklyn's public library.

Jim Marshall posed Doo Jong Kim, a Chinese artist who owns a sign company, with one of his works.

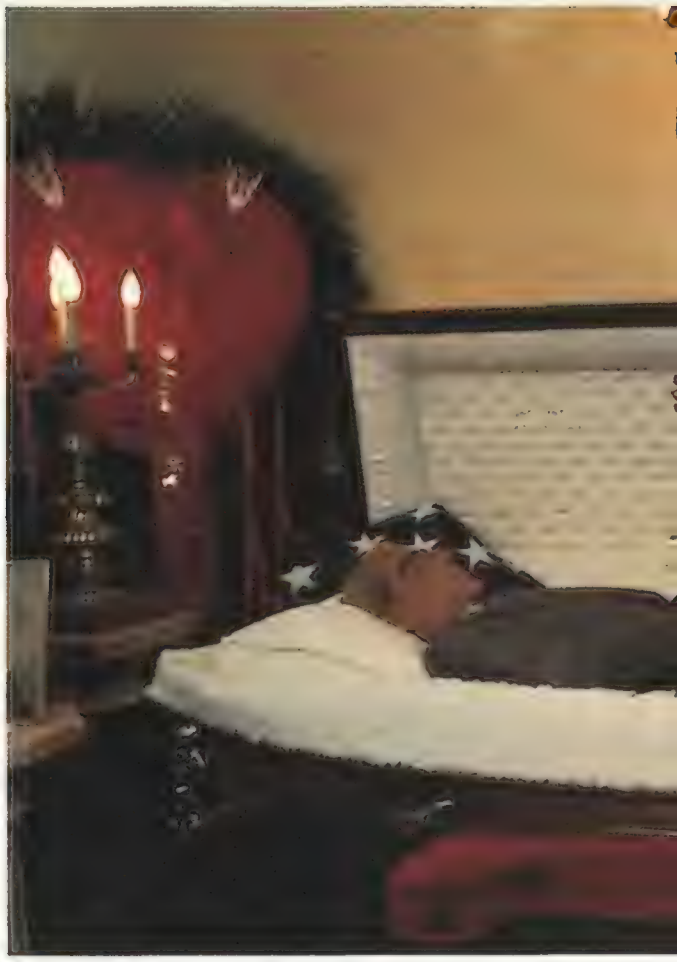
Brooklyn, "Gwan, watcha talkin' about? Watcha tryin' t'hand me?" And just for emphasis, we'd probably add, "Wanna make sumpn' of it?" Maybe having our own language is one reason we don't have to look for any other cultural roots. In the schools of Brooklyn, teachers approach English as a second language even with the natives.

Another source of this cultural pride is the certain knowledge, certain to the point of provincial paranoia, that from across the bridge, New York City and the rest of the world look down on us as the bums we really are. (The Brooklyn Dodgers were called "Dem Bums" by their own fans—with fierce pride.) Henry Miller, describing his Brooklyn childhood, wrote of visiting New York cousins in the 1920s: "I came from another part of the city, so far away it seemed to them, that it was almost like coming from another country." I can still remember my first subway ride under the river into Manhattan. Facing those fast, vibrant and violent streets alone as a teenager was like seeing the New World with an immigrant's eyes. The ride home was a return to a barbarian borough, and I realized that I would either have to escape, or celebrate its mean virtues with braggadocio and bravery. By the time I left, it was too late to escape its grip. I was a bum, a barbarian forever, and I had to love it.

There is a joke about a passenger who asks a cab driver where they are. "Nowhere," the cabbie says, "this is Brooklyn." There's an ironic truth to it, and yet the place has always driven people to make the most of life. It has spit out such writers as Walt Whitman, Henry Miller, Thomas Wolfe, Arthur Miller and Norman Mailer, for example, writers with large egos and an appetite for celebrating the seamy as well as the splendid in life. Henry Miller, noted for his gutter language and sordid world, revealed the Brooklyn in him best in these words: "Every day that we fail to live out the maximum of our potentialities we kill the Shakespeare, Dante, Homer, Christ which is in us." Yeah.

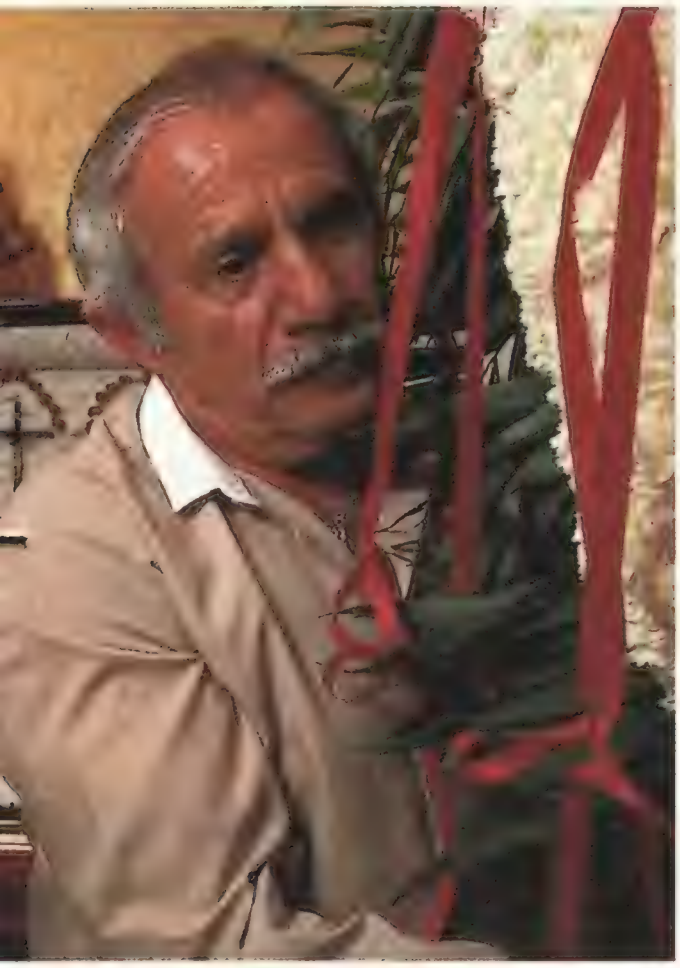
Paul Trachtman

Hal Stucker arranged artist Obidia Fischer behind sample of silver and gold dollhouse miniatures he casts.



Ricki Rosen visited a funeral parlor in an Italian neighborhood.

Larry Ghiorsy snapped four young women watching the boys go by on their street, Friday night at 11.



In quiet moment of preparation, mourner places wreath of flowers.

Len Speier found Brooklyn dressed up and dancing at Pastels, a disco jammed with nightlife on weekends.

Ricki Rosen got twins' attention as their orthodox Jewish father turns his eyes to a religious book.

Willa Zakin noted this island in a remote Brooklyn creek. The fishing here is serene amid junked cars.

Jay Maisel pictured the loneliness of Coney Island off-season, with bicyclist doing "wheelies" on boardwalk.

Lorraine Corsale photographed Sal Raguso at a riding academy with two spirited horses only he can handle.

Len Speier positioned Jonah Kinigstein, a painter of Coney Island scenes, between two of his tableaux.

David Grossman, as he got off a subway, saw in this window one of the "timeless Edward Hopper scenes."

Ricki Rosen recorded this most solemn moment at a Jewish wedding, with rabbi, groom, veiled bride.

Willa Zakin shot a classic Brooklyn backyard as John and Kathy Orloff enjoy baby, dog, cat.

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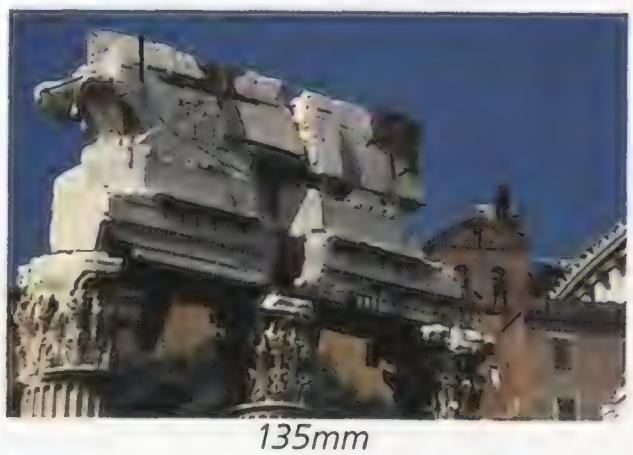

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By Marion Steinmann

'Chicken scratches' written in clay yield their secrets

The Sumerian dictionary team at Penn's University Museum is dedicated to bringing exuberant life to a long-dead language

Åke Sjöberg studies Sumerian literary tablet telling of Enki, god of wisdom, and mother goddess Ninhursag.

As you walk along a second-floor corridor at the University of Pennsylvania's University Museum, a cage-like door blocks your way. Affixed to the wire mesh is a handwritten notice.

"NÍG-ZI-GÁL É-DUB-BA-A," says Professor Åke Sjöberg as he reads the sign aloud. A ruddy man in a tweed sport coat, Sjöberg peers from beneath a thatch of graying hair, rolling the words in his rich Swedish accent, relishing the very sounds of the strange syllables. "BA-RA-SÙH-SÙH. BA-RA-LÙ-LÙ. BA-RA-ZI-IR-ZI-IR."

This is Sumerian, the oldest written language, dating back more than 5,000 years to the earliest recorded history of our species, and Sjöberg is a philologist, a specialist in language. Specifically, Sjöberg is a Sumerologist, an expert in the Sumerian language, and he heads a team of five scholars, laboring beyond the "cage" door, who are currently compiling the world's first comprehensive Sumerian dictionary. This may seem an esoteric enterprise, but it is actually a project with the most profound implications for understanding the cultural evolution of the human race: how our ancestors evolved from simple, preliterate Stone Age farmers into sophisticated, urban beings.

Sjöberg obligingly translates the notice that is wired to the cage: "The creatures in the school. Do not confuse them. Do not worry them. Do not upset them."

The Sumerians were the people who developed, in southern Mesopotamia (now part of Iraq), what was probably the earliest civilization on Earth. Sometime during the fourth millennium B.C. or before—exactly when and whence they came remains a mystery—they settled on the fertile plain of the Tigris and Euphrates, perhaps mixing with people already there. According to eminent Sumerologist and Penn professor emeritus Samuel Noah Kramer, their presence sparked a "creative spurt." They developed an extensive network of irrigation canals that allowed them to grow, in that arid land, ample food for themselves and for trade. Stone tools gave way to more-efficient copper, then bronze. The wheel, long used for making pottery, also appeared on wagons and chariots. Villages grew into great cities—Nippur, Eridu, Lagash, Umma, Sippar, Larsa, Kish, Adab, Isin, Ur (in the Bible, Ur of the Chaldees, home of Abraham), Uruk (Erech in the Bible)—ringed by lush fields of barley and groves of date palms. Local leaders evolved into full-fledged kings, ruling these Sumerian city-states while waging war with one another over property and water rights.

The Sumerians crowned their cities with huge, stepped structures called ziggurats, built of mud bricks and topped by temples to gods or goddesses. The grandest surviving ziggurat, at Ur, was dedicated to the moon god Nanna; what remains rises about 65 feet from a base 135 by 200 feet. A spectacular cache of objects—notably those of the Lady Pu-abi—unearthed

A Sumerian physician's skill with chemistry is revealed by the prescriptions on this 4,000-year-old tablet.

Photographs by John McGrail

University Museum, University of Pennsylvania

Golden bull's head with lapis lazuli beard and shell plaque with mythological scenes adorn lyre sound box.

British Museum

King-and-court war panel from "Royal Cemetery," Ur, is shell and limestone mosaic on lapis background.

nearby at the "Royal Cemetery" reveals both Sumerian artists' skill and the luxurious life that at least some Sumerians led: lyres decorated with golden bull's heads; earrings, necklaces and headdresses of gold, carnelian and lapis lazuli; a wiglike helmet of gold; a gold dagger with a filigree sheath; a golden tumbler, cups and bowls.

But above all else, as early as 3100 B.C., the Sumerians invented a system of writing. That, declared James H. Breasted, founder of the University of Chicago's Oriental Institute, "has had a greater influence in uplifting the human race than any other intellectual achievement in the career of man." It created an information revolution of sorts, allowing for the first time one generation of our species to pass on its accumulated wisdom in permanent form to succeeding generations.

Writing began, however, not for transmitting culture but for the more mundane purpose of accounting. As Sumerian society grew more complex, the need arose to keep track, at the temples and palaces, of agricultural production, taxes, rations and tributes. At first, about 3200 B.C., the Sumerians drew simple pictures: a stylized picture of a cow, say, plus three dotlike marks to mean three cows. The next crucial step came when the scribes realized that a sign could also stand for a sound: a stylized arrow could mean the word "arrow"—TI in Sumerian—and also the sound "TI."

For a writing surface, the Sumerians ingeniously fashioned tablets of clay, impressing wedge-shaped

Starting at bottom row: troops drive over prostrate enemy; they herd their prisoners; king receives captives.

marks into them with a stylus cut from a reed. The modern name for this kind of writing—cuneiform—comes from the Latin for "wedge-shaped." By 2500 B.C. the Sumerian scribes were able to write anything a person could say, and had begun creating a body of literature that would include myths, essays, hymns, fables, proverbs, epic poetry, lamentations and the first law code. Kramer, whose seminal work in identifying and reconstructing these texts has earned him the appellation "father of Sumerian literature," writes that "Sumerian belles lettres rank high among the aesthetic creations of civilized man."

Cumbersome as it was, cuneiform writing spread to other, later peoples in the Near East—Akkadians (Babylonians and Assyrians), Eblaites, Elamites, Hittites, Hurrians, Ugaritians, Persians—remaining in use for more than 3,000 years, until the time of Christ.

Professor Sjöberg leads the way past the cage into the museum's Tablet Room, which houses 27,000 cuneiform tablets from all periods of Mesopotamian history. "We are basing our dictionary in great part on these tablets," explains Sjöberg, who is also curator of the tablet collection. It is the second largest collection in the United States, after Yale's, and one of the largest in the world. Most of the tablets, he notes, were excavated between 1888 and 1900 by Penn archaeologists at the Sumerian city of Nippur, the religious and scribal center. Sjöberg deadpans, "I was not with them at the time." Sumerologists have a penchant for jest.

Penn's collection of Sumerian literary tablets is the finest in the world, he continues. Of about 10,000 that are known, 3,500 are here. These tablets have made Penn a leading center of cuneiform scholarship. "They come from all over to study and to do research," Sjöberg says. The museum also houses one of the largest collections anywhere of scholars who can read the tablets: ten. He smiles, "We always say that Philadelphia is the Nippur of today."

He opens a shallow drawer and picks out a tablet with rows of horizontal, vertical and triangular wedges. "This is the first day of school. This is how the students learned to write." It is the Sumerian equivalent of an American child practicing how to write the alphabet: *aaa*, then *bbb*. Each cuneiform sign consists of one or more wedge-shaped impressions, but "with just these three marks, you can write them all."

Sjöberg's eye is so keen that he sometimes recognizes the hand of individual scribes. "I translated some hymns to the moon god and every one was written by the same scribe." He grumbles, "He was horrible. Every tablet he wrote was bad. He kept writing on the edge.

"We have the world's oldest-known prescriptions," he continues, "from about 2200 B.C. This tablet contains 10 or 12 at least. 'Snakeskin, beer, dried plums,' " he reads, "and then they cook it. What a taste!" Another tablet has the world's oldest "recipe"—for beer.

"And this is our most precious text." Sjöberg lifts out a broken tablet about five inches high. It is the story of a great flood that destroyed much of Sumer—and later made its way into the Old Testament as the story of Noah. "This is the oldest version known. The tablet was broken when they found it; they never found the rest. There are no duplicates."

University Museum, University of Pennsylvania

Lid of the Lady Pu-abi's silver toilet box is decorated with a shell relief of a lion feasting on a wild goat.

The scribe who recorded this epic and all his fellows were the only formally educated members of society. Well grounded in the arts, mathematics, accounting and science, they also had to commit to memory 800 cuneiform signs. At the palace or temple, a scribe's duties would include accounting, writing letters, surveying fields, drawing up contracts, recording sales of land or slaves, keeping inventories of craftsmen's work. "They could write pretty fast," Sjöberg notes; one Sumerian proverb reads, "A scribe whose hand moves as fast as the mouth, that's a scribe for you." And at least some were women. He points to a text: "Here is the sign for scribe, and the person who wrote it put the sign for woman before that."

Sumerian artists, in their sculpture and mosaics, show us how the people who wrote these tablets looked: the men wore kiltlike skirts, their upper bodies naked; the women, long dresses that left their right shoulder bare, and their hair was often elaborately braided.

The Sumerians set the cultural pattern in Mesopotamia for millennia to come, but from early on the population had been a mix: people speaking Sumerian, and those speaking a Semitic language we call Akkadian, who came to outnumber the Sumerians and to dominate them politically. About 2300 B.C. the Akkadian king Sargon brought the once-independent Sumerian city-states under his rule, styling himself "King of Sumer and Akkad." About that time, Sjöberg explains, "we think that Sumerian started to die out as a spoken language." Later, the Babylonians preserved Sumerian the way we preserve Latin, teaching it in their schools and using it in religious rituals. Eventually, invaders—Persians, Greeks, Arabs—wiped out all traces of the Sumerians; the shifting sands buried the ruins of their ancient cities, and even their memory perished from the planet. Only a few legacies survived: a handful of words ("abyss," "Eden"); our division of the day into 24 hours, the hour into 60 minutes and the circle into 360 degrees.

It was not until the late 19th century that the world rediscovered the Sumerians, when pioneering archaeologists excavated their lost cities and found their clay tablets. Still, the real work remains to be done. Lacking a full-scale Sumerian dictionary, our knowledge and

Pique and poetry in Sumerian literature

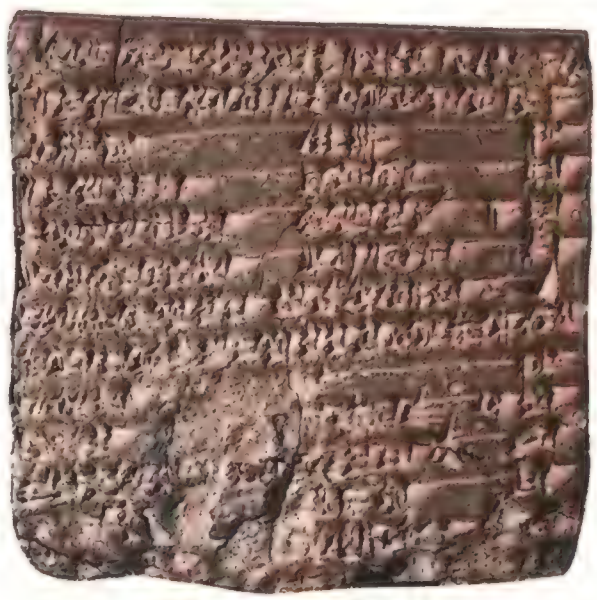
Four millennia ago a scribe berated his wayward son for choosing a life of pleasure. And four millennia ago another scribe set down, lyrically, the Sumerian epic of a great flood. Samuel Noah Kramer, who for half a century has studied hundreds of unpublished literary texts the world over, has reconstituted these stories and many more.

The earliest we know, from about 2400 B.C., is a myth about the god Enlil, the Sumerian pantheon's most important deity, and his sister Ninhursag. The NAR, or minstrel, would sing at court; there were long epics of gods and heroes, as well as love songs and drinking songs. Hymns were composed to gods—and kings—and lamentations for the dead included one to the demolished city of Ur. Other popular literary forms were disputations and essays, along with a plenitude of proverbs that were every bit as pithy as those of more recent vintage.

Working from incomplete fragments in the collection of the University Museum, Kramer translated the paternal essay and the flood story; excerpts follow.

A father's admonition

". . . why do you idle about? Go to school, stand before your 'school-father,' recite your assignment, open your schoolbag, write your tablet, let your 'big brother' write your new tablet for you. After you have finished your assignment and reported to your monitor, come to me. . . . Come now, be a man. Don't stand about in the public square or wander about the boulevard. When walking in the street, don't look all around. . . . Go to school, it will be of benefit to you. . . . I, night and day am I tortured because of you. Night and day you waste in pleasures. . . ."



The great flood

"All the windstorms, exceedingly
powerful, attacked as one,
The deluge raged over the surface of
the earth.
After, for seven days and seven nights,
The deluge had raged in the land,
And the huge boat had been tossed
about on the great waters,
Utu came forth, who sheds light on
heaven and earth.
Ziusudra opened a window of the huge
boat,
Ziusudra, the king,
Before Utu prostrated himself. . . ."

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Team members Loding, Leichty, Behrens, Sjöberg (clockwise from left front) surround tablet fragments.

understanding of these people has been, and is, limited.

Åke Sjöberg began dreaming about writing one 40 years ago, while still a student in Sweden. With an "absolutely natural" flair for language, he mastered German, English, French, Latin, Greek and Hebrew. Then, at the Royal University of Uppsala, he branched into Arabic, Akkadian and Sumerian. After he came to Penn in 1966, "Assyriologist Erle Leichty really pushed me. He said, 'Now you *have* to write that dictionary.' " (The only published source of consequence at the time, and a valuable aid, Anton Deimel's *Sumerisches Lexikon* was not a true dictionary, but an elaborate list of signs.)

What Sjöberg has done is to comb through every Sumerian literary tablet, at Penn and elsewhere, "everything published and all unpublished texts I knew," scrutinizing every cuneiform sign with his magnifying glass, teasing out the vocabulary, typing each word on a 3-by-5-inch file card. Over the years he had amassed 25,000 cards, containing just words and references. At Penn he uses a more complete system, writing a separate card for each usage of a word and including its context. At the top of each card is the transliteration of a Sumerian word, say, "ANSHE," "donkey." Next, the transliterated sentence from the tablet containing the word. Then the reference to the tablet and the line. In a concentrated spurt over the past ten years, Sjöberg has written 500,000 such cards that now occupy 116 file drawers.

The overwhelming majority of Sumerian tablets are not literary but economic. There are also inscriptions on monuments, pots and bricks. "We've used all the inscribed bricks in our basement," says Hermann Behrens, a member of the Penn team. A German, Behrens got into Sumerology via his interest in the Old Testament. He studied theology and Assyriology at the University of Freiburg and is a Catholic priest at St. Francis de Sales Church in Philadelphia, but, he stresses, "the dictionary is my first duty."

Altogether, the dictionary team estimates they have written more than a million file cards. "If we had a fire," teases Behrens, "we wouldn't go for the tablets because they would just get rebaked. But we threaten Åke all the time that we would rescue the file cards by throwing them out the window."

Since 1981, Sjöberg and his team of Sumerologists have been actually writing the dictionary. Like the *Oxford English Dictionary*, the Sumerian will be a multivolume work with some entries running many pages. Each definition will include not only the basic English translation but also "the full range of the word," says Behrens, "and the nuances"; and each will cite usages of the word in literature. The signs themselves will not be reproduced. To make their work more accessible to nonspecialists, the staff is using the standard transliteration. "We are writing a dictionary a biologist might consult."

In translating the Sumerian words, the team is building on nearly 150 years of cuneiform studies. The original decipherment of cuneiform and the resurrection of the people who wrote it was, to Kramer, a "magnificent achievement of 19th-century scholarship." Sumerian was decoded eventually thanks to the existence of bilingual texts containing the same passages in Sumerian and Akkadian. Scholars had been able to decipher the latter because of texts with the same passages in Akkadian and Old Persian. And they had originally cracked Old Persian through its similarities to later forms of Persian.

European scholars did not even know of the existence of cuneiform until the early 1600s, when travelers to the Near East began sending back inscribed bricks and copies of inscriptions on monuments. At first, many argued that the strange marks—which so resemble chicken scratchings—were merely decorative. The key that finally unlocked the secrets of cuneiform was a group of inscriptions carved on monuments at the ancient Persian capital of Persepolis. These played the same role that the Rosetta Stone played in the deciphering of Egyptian hieroglyphs. The Persepolis inscriptions contained the same passages repeated in three different—and at the time, unknown—languages.

One early clue was a simple count of the characters in each script. The most prominent used only 22 signs. This meant it was probably an alphabet, each sign denoting a single sound of speech.

The first real progress came in 1802. A young

The author, a free-lance science writer (medicine to natural history), lives in New York; her subjects range from back problems to the biology of island animals.

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First two lines of tablet at far left, excerpted from a royal hymn, were written neatly by the teacher; next two, by pupil, show sloppy configuration and alignment. At left, this third millennium B.C. stamp was designed to impress on clay bricks the dedication of a temple to the air god, Enlil. In order to be read correctly, it had to be carved in mirror image.

German philologist, George Grotefend, postulated that this alphabetic script might be Old Persian. He knew, from the work of other scholars and from classical sources, that the inscriptions were probably from the Achaemenid dynasty, which had ruled Persia from the sixth to the fourth centuries B.C. And that Persian kings were fond of repeating a stock formula, over and over, on their monuments: "So-and-so, great king, king of kings, son of so-and-so."

Two inscriptions did contain the same word repeated over and over, and Grotefend guessed that this word might be "king." If these passages followed the formula, he reasoned, then the first word in each passage should be the name of a king. As the word beginning the first passage also occurred in the second, that king might be the father of the one whose name began the second passage.

To test this theory, Grotefend turned to lists of Persian kings. Only two names fit the passages: Darius and Xerxes. The passages read: "Darius, great king, king of kings, son of Hystaspes" and "Xerxes, great king, king of kings, son of Darius." Grotefend thus proved that the language was indeed Old Persian, and his translation gave him the phonetic values, the sounds, of ten of the cuneiform signs. For example, knowing how the word "Darius" sounded in Greek and in Modern Persian enabled him to ascribe the same tones to it in Old Persian.

It was nearly half a century, however, before there was again real progress. Between 1835 and 1844 a British officer posted to the Middle East, Henry Rawlinson, laboriously copied a lengthy Achaemenid trilingual inscription carved on a cliff near Bisitun, Iran. Although unaware of Grotefend's studies, he used a similar approach. Finding kings' and other proper names, and from them, reasoning out the phonetic values of the signs, Rawlinson figured out the entire Old Persian alphabet and deciphered all 414 lines of the inscription, an account of Darius' many military exploits. Then he tackled the second script, which was Elamite.

From there, it took only ten years for Rawlinson and others to decipher the third cuneiform script from Bisitun. Far more complicated, it contained hundreds of signs. This language, Akkadian, was turning up on thousands of clay tablets at Assyrian excavations in Iraq. Some of them also contained a language even older and hitherto completely unsuspected—unrelated to any other known language, living or dead. Akkadian scribes often had written it on one line, and an Akkadian translation on the next.

When in 1869 the French scholar Jules Oppert came across the title "King of Sumer and Akkad" on a tablet, he realized that the people who spoke this ancient language were called Sumerians. They had finally been rediscovered.

Today, a century later, "we know the Sumerian signs," says Hermann Behrens, and because the ever-helpful Akkadians also drew up lengthy lists of the signs with notes of their pronunciation, "we generally know their phonetic values." A sizable body of translations now exists, but it has been only recently, he points out, that enough tablets from other collections have been published with sufficient accuracy to do a Sumerian dictionary. "We are perhaps the first generation of Sumerologists who could write this dictionary; in a sense, we are still deciphering." Out of the hordes of cuneiform tablets now in museums, "we have digested only about 1 percent," points out Erle Leichty.

"We take all the file cards for all the usages of the word," explains Behrens, "sort them out by categories and try to figure out the range of meanings." If the word appears on the Akkadian-Sumerian tablets, they start by studying the entry for the Akkadian word in the multivolume Akkadian dictionary compiled by the University of Chicago's Oriental Institute. "If the Akkadian word is not clear, you go to other Semitic languages for clues—to Hebrew, to Arabic. Often the only way you can figure out the meaning is from the cultural or literary context."

One word whose meaning the team is reevaluating is

Rain. It's as much a fact of life in England as driving on twisting roads through ancient villages. Thus, it's not surprising that long ago, Jaguar pioneered the use of water-dissipating four-wheel disc brakes. It might also explain why the Jaguar XJ6 is equipped with one of the world's best anti-lock (ABS) braking systems.

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JAGUAR

A BLENDING OF ART AND MACHINE

"ANSHE" (at left), which has usually been translated "donkey." Sjöberg has worked for weeks on "ANSHE." "There are all kinds of ANSHE," he says. "Sack-carrying ANSHE. ANSHE of a god; that is, an offering. ANSHE in front of a chariot, a draft animal. But you don't always know whether it *is* a donkey. When they say 'ANSHE from the mountains,' they mean a horse. We may very well define it just as 'equid.' "

Writing a word entry can be a long process. Take "AK" (at left), which means "to do, to make." Verbs tend to be trickier than the nouns, Sjöberg points out, because they can encompass many more meanings, and "AK" is one of the most difficult verbs of all, because—like "to do" in English—it is so common and can mean everything and nothing. There are thousands and thousands of references; sorting them all out will be an enormous job.

What impels these people to devote their lives to this work? Certainly not fortune. Becoming a Sumerologist at all is a career risk, Erle Leichty cheerfully explains. "There are few jobs in this field; there never have been many, and there never will be." Nor do they do it for fame. There are only about 250 Sumerologists in the world who can fully appreciate their accomplishment. Sjöberg muses, "You can always say we are crazy."

The Penn Sumerologists published the first volume of their dictionary—248 pages, covering *B*—in 1984. "Why did we start with *B*? One reason," says Behrens, "is that we needed a letter that showed all the problems but was not too big. Then first volumes need introductions, which means you have to know what you are doing." To everyone's surprise, *B* has proved something of a best-seller, at least by Sumerological standards. The museum expected to sell only a few hundred copies, and then only to scholars and students in the field, but others are also forking out the $40. The dictionary has become such a hot item—one physician bought four for his friends—that the *Philadelphia Inquirer* called it the "Cabbage Patch doll of the intelligentsia."

The team hopes to finish a second volume—750 pages of *A*—next year. There will be 18 volumes in all, a job that will probably take well into the 21st century. When do you expect to be done? "2030," replies Sjöberg, "maybe 2025." It is hard to tell when these Sumerologists are pulling your leg. "I am serious," Sjöberg insists. "I will be a hundred years old."

As more volumes are published, the dictionary is expected to spark an explosion of Sumerian scholarship. For precedent, the Sumerologists point to Chicago's Akkadian dictionary, which, Leichty says, "has already completely revolutionized the field. Students now learn the language five to six times faster than I did. Now we don't have to waste half our time in pure philology, but can pursue much more interesting questions. The same thing will happen in Sumerian, very rapidly."

Since the clay tablets are relatively indestructible, "we have an embarrassment of riches," Leichty says—"a kind of documentation that doesn't exist again at any time in Man's history until after the invention of the printing press. It is an amazing look back into these long-dead societies, fascinating because they are so distant from us in every way—in time, geography, culture—and so different in most respects from anything existing today. Thanks to these dictionaries, 50 to 100 years from now, Sumerology and Assyriology will be taught in most universities the way Latin and Greek are today."

In the meantime, one way the team members deal with the strain of a long-term project is by not taking themselves too solemnly. A photograph exists of Sjöberg clawing at the cage. Another picture, which purports to show a staff conference, shows only the backs of people staring out a window. As you leave the Tablet Room, you see a printed sign that reads: "Take two tablets and call me tomorrow"; someone has crossed out "tomorrow" and written "in the 3rd Millennium." And once Sjöberg was the target of a lovely academic prank. Some time ago he wrote a book called *The Moon God Nanna-Suen in Sumerian Tradition, Volume I*, but never got around to writing Volume II. One day, when he glanced up at his bookshelf, there next to *Nanna-Suen, Volume I* was a second book, similarly bound in red with gold lettering: *Nanna-Suen, Volume II*. "At first I didn't dare to go there. I thought I had lost my mind." Could he have been so absentminded that he had written the second volume and forgotten about it? Sjöberg finally got up his courage and pulled out the book. The pages were utterly blank.

Of gold and semiprecious stones, Lady Pu-abi's fanciful headdress likely tinkled and twinkled as she walked.

University Museum, University of Pennsylvania

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By Thomas A. Bass

This African lake turns out to be a fine kettle of fish

Giant Lake Malawi is home to the astonishing cichlids; they dine on fins and scales, play dead, build sand castles and even change sex

Diving into Lake Malawi's tropical blue waters is like falling into a blizzard of fishes. A rainbow-hued, fluorescent blizzard. Purple-striped, orange-flecked, blue-spotted, green-marbled fishes stream by in a brilliant parade. The colors alone indicate that something extraordinary has happened here. The lucky visitor has splashed into what seems a freak of nature, an evolutionary sport in which the natural clock dictating the division of species has been speeded up.

Famous in the aquarium trade for their color, the fishes of Lake Malawi—the most southerly of Africa's great lakes—are equally famous among biologists for their variety and behavior. Most of them belong to a single family of perchlike fishes, the Cichlidae, thought to have split over the past million years into hundreds of different species in this one body of water. More freshwater species have been identified in Lake Malawi (also called Lake Nyasa) than are found in all the lakes in Mexico, the United States and Canada combined; and virtually all of them are endemic, existing here and nowhere else.

Hobbyists, entranced by their beauty, buy 100,000 cichlids a year from Lake Malawi. Biologists, amazed by their adaptability, view the lake as a living laboratory. And because some of the cichlids, those commonly called tilapia, flourish in artificial breeding ponds, they are among the predominant species raised by aquaculturists around the globe. In the United States, breeders are pleased with a growing demand for tilapia, but are struggling with the difficulty of keeping the hearty stock from escaping into the country's lakes and streams, where they have few natural predators. Recent news indicates that cichlids may even have a promising career in medicine, by eliminating an insidious tropical disease. These wonderful and bizarre fishes are so special that a national park has been established to protect them.

Cichlids survive in the enormous, 80-degree tropical aquarium of Lake Malawi through an amazing array of adaptations. During the mating season the males are highly aggressive and territorial, dividing their days between sand-castle building, courtship and turf wars. The females of most species are mouth brooders—their eggs are fertilized and hatched in their mouths. In some species, the fry are carried there (p. 147) until old enough to be dropped off in communal nurseries, where they school by the thousands. Cichlids dance when courting and the males dress in brilliant colors to attract members of the opposite sex. Some of them mate in fanciful sand castles built on the bottom of the lake (pp. 152-53); the castles are actually comparable to bird bowers or display sites, as their sole function is to attract females who will mate there. Some tend algae gardens and, when food is in short supply, switch from eating zooplankton to eating one another. With cichlids having adapted almost every conceivable form of fish behavior, there is no better encyclopedic text for studying the mechanisms of vertebrate evolution than the waters of Lake Malawi.

Chembe fishing village in Lake Malawi National Park appears idyllic, but overfishing threatens its future.

A zoologist with a cichlid obsession

My guide into the depths of the lake is Ken McKaye, a zoologist at the University of Maryland, who spends several months a year in Africa. McKaye is a go-getter, an intellectual live wire, who jumps up every morning to ask himself the same two questions that have preoccupied him for the past ten years: How did so many species come into being? How do they manage to coexist? "There isn't a single problem in vertebrate behavior you can't study with cichlids," he says. "Whatever the year's hot topic, whether it's the evolution of altruism or of aggression, these fishes are out there doing it, providing the perfect model."

At the start of a typical day, McKaye and I bail out his old plank boat, kick over the Seagull engine and chug off into a balmy, pastel morning. Slipping away behind us are the golden sands of a beach shaded by palm trees and mangoes. Rising above the beach is the mountainous amphitheater of the Cape Maclear (Nan-

Photographs by Anthony Bannister

kumba) peninsula, whose green-shouldered hills tumble 3,000 feet into the lake below. Four small islands float in front of us like emerald hatpins on a turquoise beret. Thirty miles across the water lie the blue mountains of the Great Rift Valley escarpment, thrust up as a result of continental drift.

The ninth-largest and fourth-deepest lake in the world, Lake Malawi is actually an inundated slice of the Great Rift Valley, which stretches the length of Africa from the Red Sea to central Mozambique. The 11,430-square-mile lake is bordered by Tanzania and Mozambique to the north and east, but most of it lies within the nation of Malawi, a landlocked, densely settled country that depends on the lake for its survival. Much of the paper money in the country is etched with pictures of fishermen casting nets into the lake, and two-thirds of the nation's animal protein comes from these abundant waters.

The lake can be treacherous; sometimes tropical storms rush over it without warning, but today it is showing its sunny, benign face as McKaye and I anchor off the islands and don our scuba gear. We drop 50 feet into an arena of mating cichlids. Carrying a tape measure and underwater slates for writing, we will spend the next several hours watching courtship displays and mapping cichlid sand-castle dimensions. This is part of McKaye's current research on sexual selection—the mechanisms by which females choose the males they will mate with in a breeding season. It is McKaye's hunch that female choice is one of the driving forces behind the species explosion.

In what must rank as a peak experience in biological voyeurism, we head for the largest natural mating arena ever discovered, a 2.5-mile-long cichlid city built out of sand castles and defended by 50,000 males dressed in brilliant blue. On our way through, we stop for a tour of the surrounding communities, which gives us a sense of how different cichlid species have evolved to fill the many niches in the lake.

Where the islands off Cape Maclear angle down into the water lie rock faces covered with *mbuna*, the small, brightly colored cichlids so prized by hobbyists. They don't build sand castles in their rocky home, but they have bright colors that may attract females. The sunlight that rakes through the lake's waters illuminates a natural fish tank filled with blue zebras, orange morphs, red tops and golds, nibbling algae off the rocks and defending their territories with aggressive darts at passing strangers. Two fish spiral up from the lake bottom with their mouths locked before the fight breaks off and one mbuna flees. McKaye directs my attention to an upside-down fish, one of the several species in the lake with reverse coloration—light on top, dark on the bottom—that flips over in the water, concealing itself from its intended prey before a surprise attack. We pass another fish with a great curved beak of a face designed for hunting around corners. It drifts toward the bottom and rests on a rock before swooping over

All: Paul V. Loiselle

Courting utaka circle together before the female lays her eggs (left) and then turns swiftly and gathers them in her mouth (center). Female nuzzles the male anal fin and sperm vent (right) to fertilize the eggs orally.

Ken McKaye

Ken McKaye

Cichlids adapt fantastic physical characteristics for survival: mouth (left) easily scoops zooplankton; the head rammer's basket mouth (center) catches eggs; and "fat lips" (right) sucks its food from cracks in rocks.

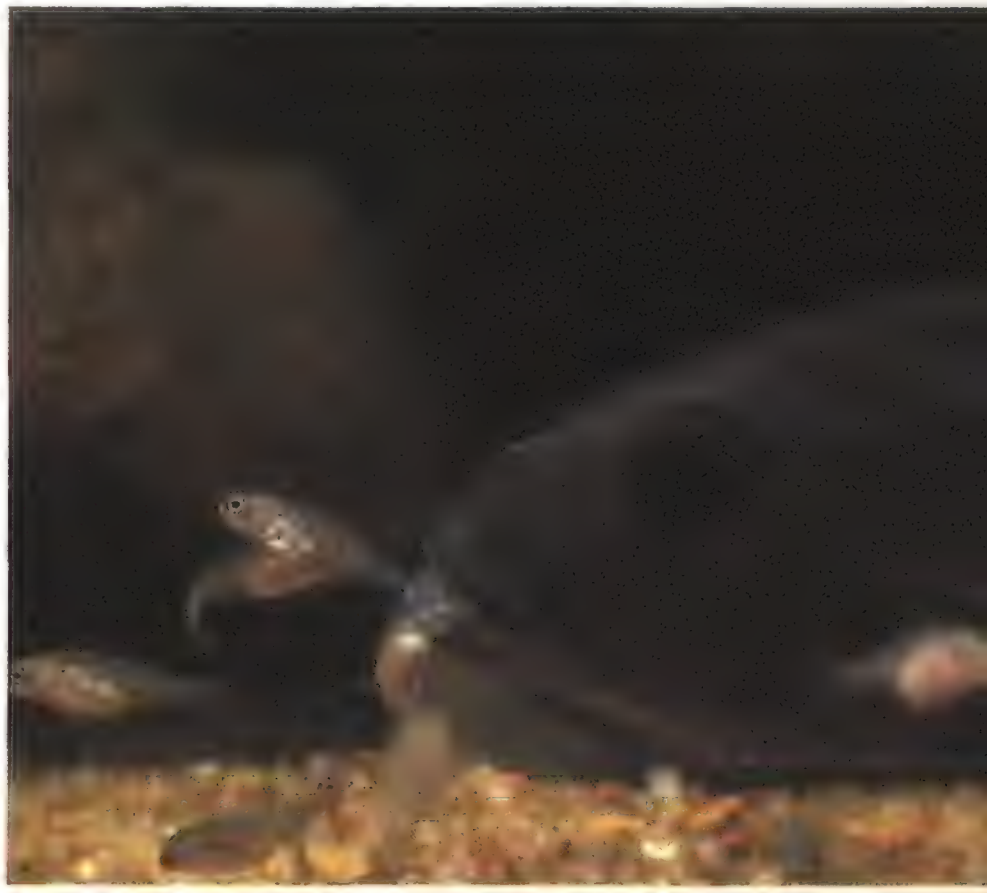
the edge onto an unwitting victim. We watch another mbuna, whose Latin name translates as "fat lips" (above), wedge its gasket mouth over a crevice and suck out a meal.

Fin biters and scale scrapers—fishes that survive by lunching on the body parts of their neighbors—nip at my legs. I turn for a moment to float on my back. The water above me is filled all the way to the surface with flocks of silvery *utaka*—small zooplankton-feeding fish that are one of the staple foods from the lake. Scattered among the utaka are thousands of translucent mbuna females waiting to mate with the brightly colored males below.

The appearance among the rocks of waving aquatic plants and grasses marks the shift into the cichlid weed community, where many of the fishes look like pieces of green vegetation. I give way to a needle-nosed fish known as *Cyrtocara compressiceps*, so named because its compacted body makes it hard to see head-on. This is the famous Lake Malawi eye plucker, a fish that was once thought to be so specialized that it survived by eating only the eyeballs of its compatriots. To debunk the eye plucker's claim to fame, McKaye examined the contents of hundreds of stomach cavities and was unable to find a single plucked eye. The eye plucker, he says, actually consumes all, not just the eyeballs, of its fellow fish. Another species, dressed in brown and white, swims by, then suddenly falls into the weeds, covers itself with sand and goes pasty white. This fish, McKaye tells me, is more deserving of our admiration. Of all the species in the world known to "play dead" to confuse predators, this is the only one that feigns death before leaping up to attack its prey (p. 152).

In clearings among the weeds, brooding females stay near the lake bottom, avoiding the head rammers (above), whose specialty is known as paedophagy—baby eating. They attack the brooding females, knock the

Species occupies discarded snail shells; female may change sex if breeding male (above) doesn't visit.



A mbuna mother raises young in her mouth; she can carry 15 to 20 fry until they are big enough to leave.

Ken McKaye changes a tire on Land Rover en route to his remote laboratory on the shores of Lake Malawi.

eggs or fry out of their mouths, and eat them. The paedophages swim high, steering clear of defending males, before suddenly zipping at their prey, where head ramming might shake loose a meal. One of these rammers has a jaw shaped like a racing prow; it hits the female from below at a 70- to 90-degree angle and the eggs just drop into its mouth.

We descend next into the pockmarked terrain of the sand-dwelling fishes, a community made up of hundreds of species. One of them inhabits empty snail shells (p. 147) and is known for its ability to change sex. The breeding male of this species visits the shells of the females of his harem. However, should he fall victim to a predator and fail to show up, one of the neglected females will develop testes and take his place. Twice yearly, in underwater migrations as spectacular as any across the Serengeti Plain (SMITHSONIAN, February 1987), many of the sand-dwelling species flock inshore by the millions to breed in the lake's shallow water. The males set to work building their sand castles. The shape of these structures is unique to each species, so the lake bottom is trenched and mounded into a fantastic array of craters and cones. Pits two feet deep and ten feet across lie next to towering volcanoes about two feet high and seven feet in diameter. On top of the volcanoes and down in the pits are little beds of sand (which McKaye calls "courting platforms") being fussed over by nervous males.

Dominant in this particular vicinity are fish with blue heads and yellow dorsal fins—the flashy colors these males wear for their breeding season. For the two weeks the male endures in this arena, he will spend most of his time as a living dump truck, hauling sand in his mouth to build a pharaonic construction that has to be defended from intruders on the average of once every 20 seconds.

Cichlid sex is polymorphous and promiscuous. Competition among males is intense with many of them clamoring to get in on the act. As the females parade overhead, the males below fan their fins and wiggle their egg spots—brilliant patches of color next to their sperm vents that are thought to serve as a kind of target. When all goes well, a female will do a little circle dance with a male and lay several eggs at his display site. They remain there only long enough for her to turn, scoop them into her mouth and turn again to have him fertilize them orally. Then she goes off to dance with other males in the arena.

But during courtship, more often than not, the male is distracted and has to shoot up through the water to attack nest darters—fish specialized in stealing eggs before the female has pouched them into her mouth. Frequently, the male zips back to find his partner cavorting with his neighbor. More fanning and tail wiggling, but the first male fails to lure her back. It may be that she takes multiple mates as an adaptive response to increase the genetic variety of her offspring. Worse yet, "she" might be a sneaky male, masquerading as a female, who has slipped in to eat eggs or to make fertilizations of his own. Meanwhile, catfish and other predators lurk in the nearby rocks, hoping to pick off distracted cichlids caught flagrante delicto. Nest darting, head ramming, mate swapping, transvestism, sudden death—this is surely an exciting yet precarious world.

When Ken McKaye first arrived on the shores of Lake Malawi in 1977, fulfilling a lifelong ambition, he quickly became depressed. His problem lay in the fact that the lake was everything he expected and more. "I was overwhelmed by the system. No one knew the names of the fishes other than the common ones or the species exported in the aquarium trade. So I took a

Thomas Bass has expanded his account of Lake Malawi into a chapter for his new book on scientific expeditions, to be published by Houghton Mifflin.

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Jay Stauffer prepares a newly caught fish for closer scrutiny so he can tell if he's found a new species.

deep breath and said, 'McKaye, all you can do is take it one fish at a time. Pick a species and settle down and learn everything you can about it.' "

He chose *Cyrtocara eucinostomus*, a pointy-nosed zooplankton feeder, from among the utaka and is still working on it today. But as he realized from the start, to comprehend the larger system of a lake with at least 250 described species and probably two to three times as many undescribed species, he needed some help. Over the years a number of graduate students came from the United States, and many Malawians have been involved in the project, working as divers, artists, and ecologists. McKaye hopes Malawians will one day be operating their own fisheries programs. A few years ago McKaye was lucky enough to find a partner who shared his obsession.

If McKaye is a Type A personality, his colleague, Jay Stauffer, is an A+. Stauffer, a professor of fishery science at Pennsylvania State University, has published an extraordinary number of books and articles. When he was in a car crash that put him in a coma for 12 days, he came out of it talking about fishes. He keeps 10,000 pickled cichlids in jars in his office. "Why do you need so many?" I ask him. "Because one might be a new species," he says.

Stauffer is a taxonomist, someone responsible for sorting out and naming the 20,000 to 40,000 fish species in the world. McKaye laughs about their first meeting. "This guy came into my office and asked me, very earnestly, if it were possible to go to Lake Malawi and describe a new species. There are so few unnamed fishes left in North America, and all his life he'd dreamed of finding one."

"I knew it was one of the biological wonders of the world," says Stauffer, "but I was astonished, on my first visit to the lake in 1983, to find that half the fishes pulled up in every trawl are unnamed species."

Tilapia take over Florida lakes

Beyond the fishes endemic to Lake Malawi, another 1,000 described cichlid species can be found on the Indian subcontinent, and throughout Africa and the Americas. Cichlids, in fact, provide a nice bit of biological evidence for the theory of continental drift. Their range is most of Gondwanaland, one of two Mesozoic landmasses that broke up into today's continents. In the Americas, cichlids naturally occur as far north as the Rio Grande, but after being introduced accidentally they have expanded their range throughout the Southeastern United States. The large tilapias now make up a significant amount of the biomass in Florida's Dade County canals having been introduced into the bass-fishing lakes of Florida. Cichlids can take over a body of water in three years. Recently, Stauffer was amazed by reports of blue tilapia as far north as the Susquehanna River in Pennsylvania, where they survive by wintering in thermal outfalls from power plants.

After observing mating behavior for several days, McKaye and I take a break and spend a week helping Stauffer, who is still recovering from the car accident, with his Lake Malawi fish collections. We work underwater chasing cichlids into gill nets, where they hang in the green filament like Christmas-tree ornaments. Transferred to collecting bags and hauled to the surface for photographs and notes on color, the fish begin their long journey from Lake Malawi to Washington, D.C. via diplomatic pouch, where some will become part of the cichlid collection in the Smithsonian's National Museum of Natural History. Others will be shipped from there up to Stauffer's lab and undergo months of comparative analysis before Stauffer can confirm the dozens of new species. Eventually, some of them will make a return trip to Malawi to be housed in a proposed fish museum.

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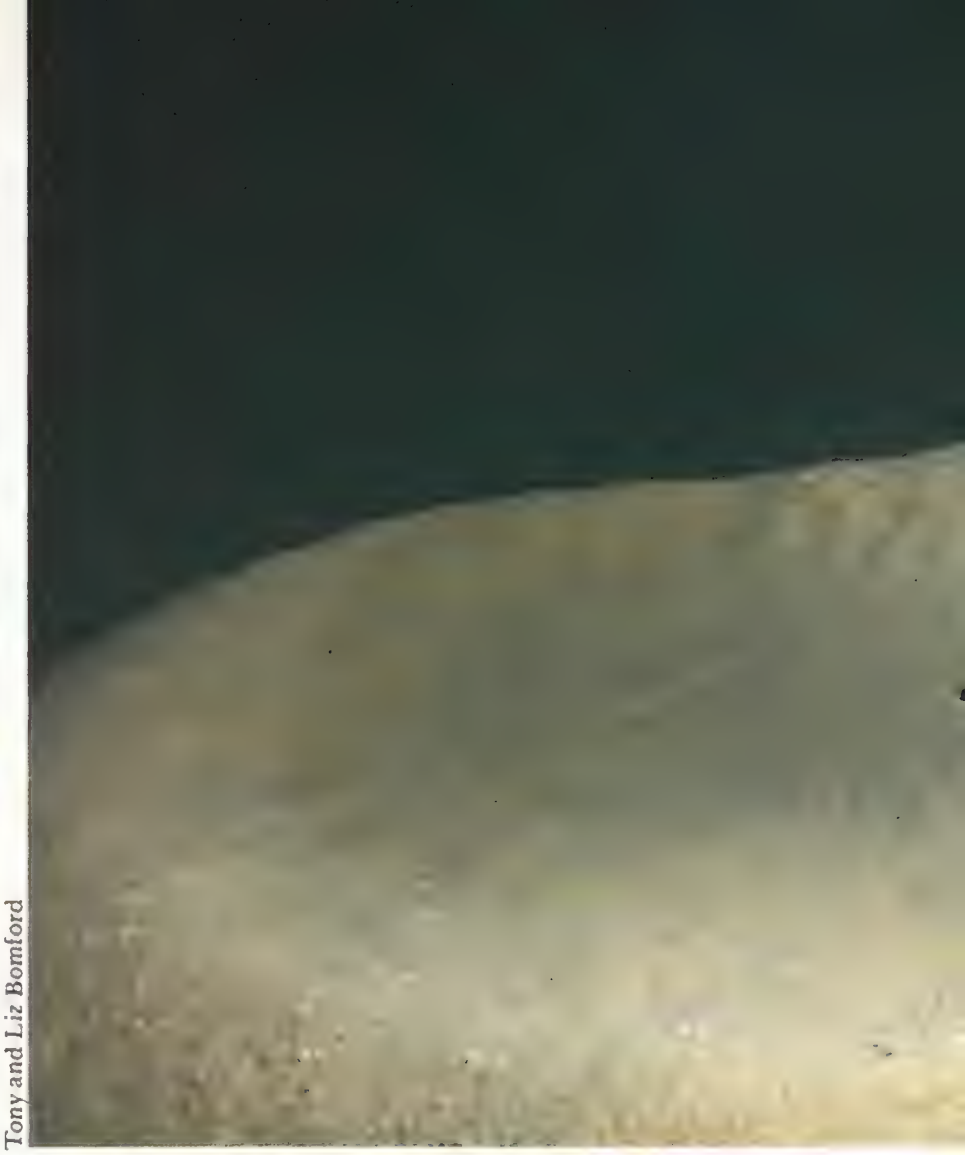
Mouth-fighting male cichlids are moving in a circular pattern, an aggressive behavior called carouseling.

Ken McKaye

Death-feigning fish appears to be a rotting corpse; when others come to graze, it can dart up and eat them.

Catfish guards brood and a few cichlid fry (lower left) who graze on periphery, safe from predators.

Tony and Liz Bomford



A male cichlid hovers over his sand castle, fanning his fins to entice any passing females to lay eggs there.

"What's in a name?" asks McKaye, reflecting on Stauffer's taxonomic passion. "Shakespeare's question becomes interesting when you try to figure out the underlying mechanisms by which these fishes are speciating." The traditional explanation—that new species arise only when populations are geographically isolated from one another—is insufficient for Lake Malawi. Here, the same environment can be saturated with dozens of closely related but reproductively isolated species. The picture is further complicated by the fact that these species look morphologically identical.

If you think of fish behaving like birds, then the sex life of cichlids and its evolutionary implications are easier to explain. The process is known to biologists as runaway sexual selection, with one of the best examples being the peacock's colorful tailfeather display that was adapted as a sexual lure. The key to the puzzle concerns speculation about whether something as subtle as female preference—for gold or blue males, tall or wide sand castles—can be responsible for splitting one cichlid species off from another.

"It's very difficult to tell one of the nine *Lethrinops lituris* species from another when it's pickled in a jar," says McKaye. "You have to get in the water and look at their behavior." Reproductive isolation is due to variations in female mate choice and not solely to adaptive changes between the two populations. For example,

He spends his time in the mating arena hauling sand to maintain his bower and defending it from others.

females of one species will mate only with big-nested males, while females of another species go for mates with small but centrally located nests. This may be the result of a system in which sexual selection is the mechanism causing speciation.

The idea that closely related vertebrate species can evolve and occupy the same geographical area is known as sympatric speciation. The concept is heretical to some biologists, who insist that species must develop in geographical isolation from one another. But the evidence from Lake Malawi has led a few evolutionary theorists to accept the possibility. Cichlids are genetically variable—they can produce varieties ranging in color from gold to black. If color morphs choose to mate assortatively, that is, gold with gold, and black with black, ultimately this could result in two reproductively isolated groups, hence two distinct species. What produces this and other kinds of assortative mating? So far, nobody knows.

"Things specialize to get through a bottleneck," Stauffer speculates. "Scale eating and fin biting must have evolved when times were tough." Whether speciation takes place through the preferential mating of color morphs, or female choice of one kind of courtship display over another, or the dictates of an ecological crunch, the explosion of species in Lake Malawi remains a fascinating conundrum.

Black splotches on this orange cichlid were adapted as a protective disguise that blends into rocky home.

This orange mbuna is prized by hobbyists who annually buy 100,000 cichlids a year from Lake Malawi waters.

One of the staple foods from the lake is the utaka, a small zooplankton-eating fish netted by fishermen.

Chimbale Chidenje (right) and Ojinja Mhone dry their catch; lake's fishes provide nation's animal protein.

In recognition of their evolutionary importance, 36 square miles—including water extending 100 yards into the lake, 12 islands at the southern end of the lake, several mainland forest reserves and much of the Cape Maclear peninsula and its bay—were established in 1980 as the Lake Malawi National Park. Four years later the park joined other African treasures, like the Serengeti Plain and Mount Kilimanjaro, in being listed as a UNESCO World Heritage Site.

The World Wildlife Fund plans to build an interpretive center, but for the moment the park welcomes its few visitors—travelers from Europe and fish freaks from around the world—with nothing more than a lot of cichlids to stare at. At Cape Maclear there is a fishing village of thatch-roofed houses, where people occupy themselves hewing dugout canoes, mending nets and drying their fish on the shores of a lake generous enough to feed a nation. Given its turquoise coves and equatorial sun, the scene could be Caribbean, except for the African fish-eagles standing sentinel in the acacias, the hippos surfacing with grunts off Otter Point and the occasional crocodile crawling ashore to sun itself on the beach.

Like other tropical idylls, the calm at Cape Maclear may be deceptive. Fish yields from the lake are declining. Outside the park boundaries, and even within them, there are signs of overfishing. There are efforts under way to introduce exotic species, which could, as in the case of Lake Victoria, disastrously affect the endemic stock and the people who earn their livelihood fishing it. Another potential threat lies in the pockets of oil and natural gas that underlie the lake. These have yet to be exploited, but one spill from a drilling rig in this inland system could wipe out dozens of fish species representing millions of years of evolution.

To meet these challenges, McKaye and Stauffer have expanded their efforts on a collaborative research program with the University of Malawi. Armed with fellowships for advanced degrees and with other support from Penn State, the University of Maryland and West Virginia University, their goal is for Malawians to sustain their own research. The program's initial experiments, conducted in fish ponds at the University of Malawi, could have startling and diverse applications.

Schistosomiasis is a parasitic disease caused by blood flukes entering the body, where they lay eggs and propagate in human tissue, causing lesions and liver damage. At least 200 million people in the tropics are already infected and some will eventually die from this disease, and the problem grows worse each year. For the past few years, McKaye and his colleagues have been looking at snail-eating cichlids. "We had some ideas about snails as discrete food packages," he says. "We thought of them as nicely quantifiable bits of data in the ecology of fish behavior." But suddenly he realized the enormous potential of the half-dozen species of cichlids that like to eat snails, and the repercussions for humans: cichlids like to eat snails so much that those thin-shelled *Bulinus* snail species that are the vectors for spreading schistosomiasis are completely absent from the open waters of the lake. Could this be why Lake Malawi is free of the disease? Could cichlids offer a means to control it? The 600 million people at risk in the tropics would be grateful indeed if a Lake Malawi cichlid came to their rescue.

It sometimes takes more than 10,000 years for a new species to evolve. The process may be faster in Lake Malawi. How fast no one knows. But when I jump into a lake replete with a thousand species of shimmering fishes it seems that evolution is taking place right in front of my eyes. From one day to the next it is possible to find new varieties assortatively mated and established in niches of their own. Voilà! A new species has come into being, not by striking out into virgin territory but by making a simple choice.

Along with their adaptability, which offers intriguing insights into the mechanisms of evolution, cichlid fishes are protein to a nation. Because of their suitability for aquaculture, they may ultimately be protein to the world. Among their other surprising attributes is the potential they hold for fighting one of the world's worst diseases. In fact, these fishes are the latest example of Pliny's dictum, *Ex Africa semper aliquid novi*: There is always something new out of Africa.

A Lake Malawi fisherman heads ashore with his daily catch as a late-afternoon tropical storm gathers.

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By Benjamin Forgey

Lawrence Halprin: maker of places and living spaces

The landscapes that he creates are based on a combination of science, ecology, esthetics and all-encompassing humanity

Viewing this picture of Lawrence Halprin on north California coast, a colleague's reaction was skeptical.

On a pleasant, clear afternoon, Lawrence Halprin ambulates his handiwork—Levi's Plaza, an urban park on flatlands between abandoned warehouses along San Francisco Bay and the eastern foot of Telegraph Hill. It's a splendid, surprising place with a great boulder fountain, a paved plaza, undulating green hillocks, a winding man-made stream, beautiful trees placed just so, and plenty of welcoming nooks.

In one of these, Halprin comes upon a woman seated alone in dappled shade. Rhythmic splashings of water make a soothing backdrop for her meditations. A smile lights up Halprin's deeply tanned face as he turns to his guest and says, "I plan for that."

Levi's, completed in 1982, is a late masterwork, its seemingly effortless complexity a summary of all that has gone before. Halprin, now 72, a handsome, intense man with a warm, weathered, bearded visage and fierce eyes, has a right to be proud. He's customarily described as a landscape architect, which is fine, as far as it goes. But he's also an ecologist, environmentalist, city planner, urban designer, architect, writer, theorist, artist. What it all adds up to is that he is one of the preeminent place-makers of the 20th century.

Planning and designing common spaces where human beings can meditate or move about, privately or together, has been the leitmotiv of Halprin's adventurous 40 years as a professional. He has done it many times and many ways in the San Francisco Bay Area, his home since the end of World War II, and also in Seattle, Fort Worth, Minneapolis, Los Angeles and Portland, Oregon, as well as in Florence, Italy, in Jerusalem, and in other cities big and small.

The Bay Area is a textbook of Halprin's growth. From early residential gardens in the hills of Berkeley or Marin County, to booming downtown San Francisco, where he's masterminded such large, complex projects as the remaking of Market Street and created such remarkable spaces as Ghirardelli Square, Embarcadero Plaza and Levi's, to the windswept coastline of Sea

The man from Brooklyn, asked why he looked so macho: "I was afraid I was going to fall off the cliff."

Ranch, an extraordinary development 100 miles north of the city, the Bay Area has been his principal laboratory for thought and action.

Like most San Franciscans, native or adopted, Halprin firmly believes the city to be America's most beautiful, and he thinks and speaks of the Bay Area as a regional ecological whole. His lifestyle mirrors this conception. Halprin's office is located in the city itself—it's a commodious, made-over warehouse in a low-rent, low-rise, transitional zone south of the downtown skyscrapers. His home is a wooded retreat in Kentfield, on the eastern flank of Mount Tamalpais north of the city, where he and his wife, Anna, an avant-garde dancer and choreographer, have raised their family. Halprin, of course, designed the pathways and the redwood dance deck, for more than 30 years the setting not only of Anna's investigations of dance but also of Halprin's own fruitful early experiments to track the ways real

Photographs by Kim Steele

Four acres of Levi's Plaza, completed in 1982, is an oasis of tranquility in downtown San Francisco.

people move around in real spaces. Involving students, dancers and professionals in diverse fields, the experiments were encounters in which no one could anticipate the result, but through which dynamic and vital solutions to problems of public and private space were suggested.

Halprin was born in Brooklyn in 1916. His father, Samuel, was president of a scientific-instruments export firm; his mother, Rose, was a prominent figure in American Zionism. One can see budding in Halprin's early life many of the patterns that have characterized his maturity. It may not be farfetched to see something of his mature persona—the tension-filled combination of passionate independence with an equally strong belief in close collaboration—in his high school career as a baseball player. In this team-oriented sport Halprin was a star and his position was that of pitcher, the most independent yet in-control member of the team.

Halprin's teenage experiences on a kibbutz between Haifa and the Sea of Galilee directly foreshadowed his intellectual and practical involvements with communities and the commonality of public spaces. "It was utopian, idealistic and socially adventurous," he recalls enthusiastically. "I learned the idea of labor as a value there—it's not something you do when you can't do something else. And the common ownership of things communal—you could read directly from that some of what we did at Sea Ranch. Plus, we planted great acres of trees in those rocky hills at Sea Ranch," he continues. "I planted more than half a million trees there." Halprin's idealism obviously hasn't been lost, just tempered by long experience.

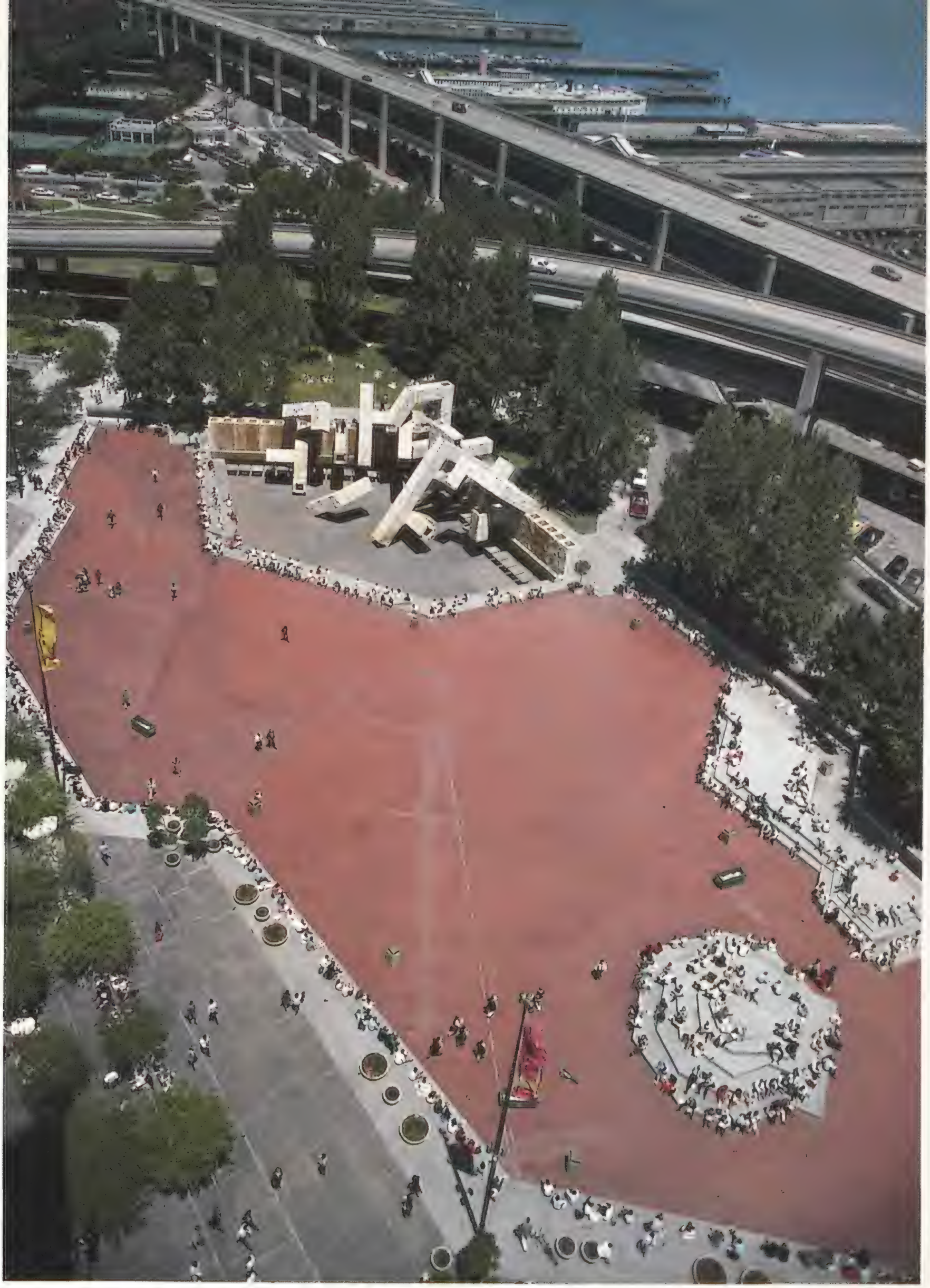
He was a city boy who also loved nature and the country. When college time came he chose not a city school but the Cornell University School of Agriculture in upstate Ithaca, from which he received a B.S. degree in 1939. Two years later he received a master's degree in horticulture from the University of Wisconsin. At both institutions he put together an unusual assortment of courses—botany, geology, geography, landscaping—that transcended the norms of the time. "I studied what amounted to ecology," he reflected, "but of course nobody called it that."

In his mature career Halprin became the most ecologically conscious of designers—he sees mankind as an integral part of complex ecological operations. Perhaps more fully than that of any other major designer, Halprin's approach fits the prescription of Ian McHarg, another seminal figure in postwar landscape architecture. McHarg's important 1969 book was titled *Design with Nature*, and this succinctly is what Halprin seeks to do.

As a scholarship student at Harvard's Graduate School of Design, with an outstanding group of classmates (including Philip Johnson, I. M. Pei, Edward Larrabee Barnes and Paul Rudolph) under a stellar collection of teachers (architects Walter Gropius and Marcel Breuer, designer-photographer László Moholy-Nagy and landscape architect Christopher Tunnard), Halprin added a solid grounding in architecture to this impressive base. "I'm good at a lot of things, but I'm best at designing," he has said unselfconsciously.

At Harvard he also encountered San Francisco architect William Wurster and his wife, social planner Catherine Bauer Wurster. Their friendship was to in-

Architecture critic for the Washington Post, *Benjamin Forgey wrote about the Berlin design renaissance,* SMITHSONIAN, *December 1986.*



Embarcadero Plaza lies alongside wharves of San Francisco Bay. With the freeway ramp adding a sense of speed, it was constructed for public celebratory events. It is an open, breezy, urban space—and much used.

Young people seem entranced at Ira Keller Fountain, part of extensive open-space sequence in Portland.

fluence his decision to settle in San Francisco when he mustered out of the Navy as a lieutenant junior grade in 1945. Postwar San Francisco was an exciting place to be for a young man with his ambitions and talents. Noted landscape architect Thomas Church was there; Halprin practiced in Church's office until 1949, when he went out on his own. And there was the background of a proud, idiosyncratic regional architecture.

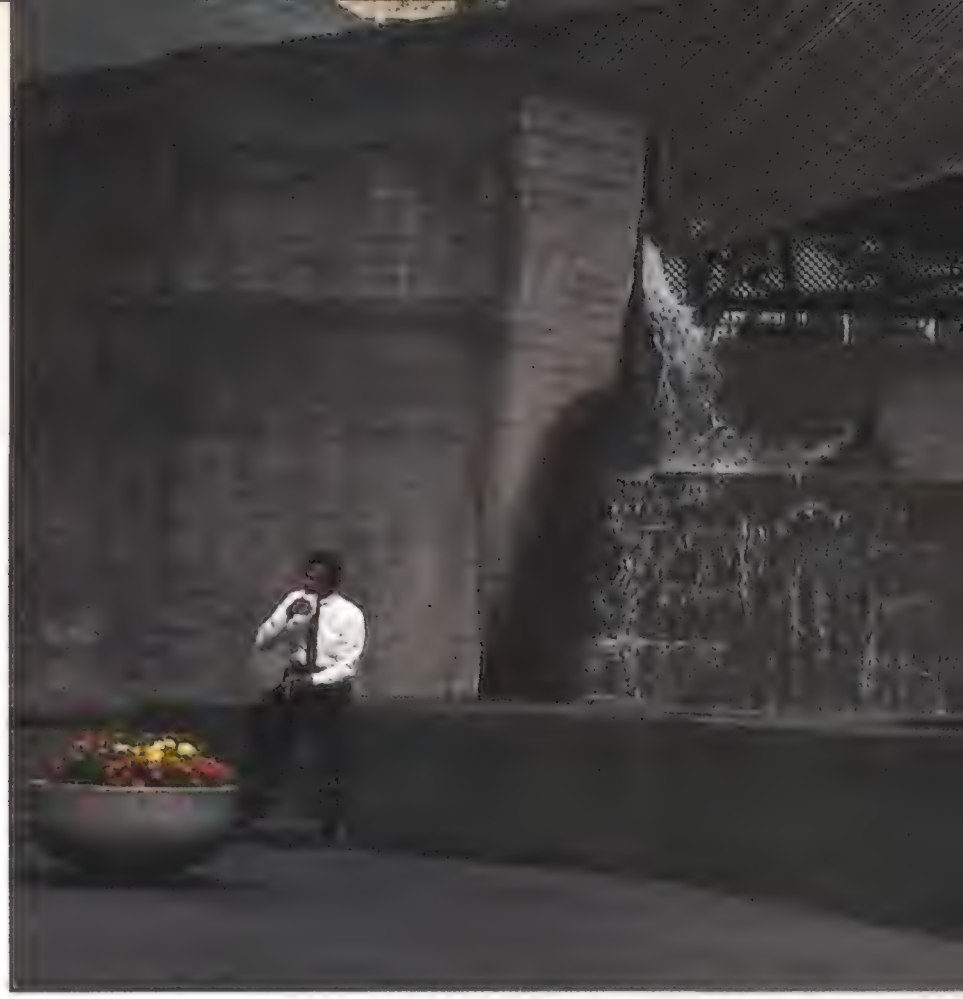
In the 1930s Wurster and a group of similarly talented young architects had begun to experiment in what was to become known as the "Second Bay Tradition" (following the turn-of-the-century "First Bay Tradition" of Bernard Maybeck and others). An important characteristic of this group was that it consistently conceived of the natural site as an integral part of the building art. Not a few of the expansive "outdoor rooms" attached to their residential projects, including those of his own Wurster-designed home in Kentfield, were designed by Halprin in the late 1940s and throughout the '50s.

No less important was the fact that in Berkeley a group of landscape architects and city planners had sewn the seeds of the strong regional planning movement that was to have significant positive impact on the Bay Area—helping, among other accomplishments, to save the bay itself from a disastrous amount of landfill. Their efforts were instrumental in the creation of the College of Environmental Design of the University of California, whose program of interdisciplinary breadth perfectly complemented Halprin's interests.

All of this was grist for young Halprin's mill. In addition, as his longtime friend and former associate Jim Burns points out, because of his work with Anna Halprin and her San Francisco Dancers' Workshop, "he spent a lot of time collaborating with people in areas of an art seldom encountered by most landscape architects: composers, musicians, scene and lighting designers, scriptwriters, performers, choreographers."

Halprin's professional interests and his involvement in avant-garde theory and practice continued to feed into each other, with surprising results. He conducted a series of unusual "Experiments in the Environment" at his place in Sea Ranch and elsewhere, participatory gatherings designed to uncover intuitive, collective responses to the natural and urban landscapes. Out of these experiments emerged, in the public sphere, what Halprin called "Taking Part" workshops, which were processes designed to get all elements of a community involved in helping to make decisions about its future. Such workshops helped to create a consensus behind a revived riverfront park system in Fort Worth, for example, and an invigorated Main Street in Charlottesville, Virginia.

Halprin's primary interest remained the urban park. As early as 1949, in a magazine article he had defined a garden as "a framework for activities." He invented a



Lovejoy Plaza, in Portland scheme, finished in 1967, brought quick recognition to Halprin and colleagues.

Full panoply of Keller Fountain (left) was conceived as an abstraction of a High Sierra mountain stream.

system he called "motation" (a word combining "movement" and "notation"), basically an alphabet of symbols indicating the principal characteristics of a given place, and the speed and direction of movement through it. On a freeway, for instance, you would have to know how many cars moved from one place to another and at what speed, the peak hours of travel, and the like. Motation can describe this. But, he adds, you would also want to imagine how esthetic and human needs, such as skyline and other views, might be met in the design. In the 1960s he refined and expanded this idea. This system enabled Halprin and colleagues not only to better record movement through the physical environment, but also to better design spaces in a way that guarantees a satisfying variety of activities. At Nicollet Mall in the heart of Minneapolis, for instance, through the use of curvilinear design, plantings, textures and stonework, Halprin has given an urban center an ambient, relaxing thoroughfare through which people obviously enjoy strolling, busy as they are.

All of Halprin's designs reflect this passion to give people as many options as possible—to go this way or that, to reverse directions, to pause, to start over, to be alone, to meet others, and to experience as many different sights, smells and sounds as the site permits.

The '60s, not coincidentally, was the decade of Halprin's emergence as an international force in urban and landscape design. In January 1960, the Lawrence Halprin firm incorporated into Lawrence Halprin & Associates, "an interdisciplinary group of planners, landscape architects, architects, ecologists, designers and photographers devoted to evolving experimental work that addresses broad issues of environmental design as well as social and political issues in regions, cities and public spaces."

For more than a decade this ambitious, high-energy crew would attract many of the best and brightest young designers from around the world. In 1962 alone, the firm began work on Sea Ranch, Ghirardelli Square and Embarcadero Plaza, and on Nicollet Mall—an amazing list. Each of these projects would have a major impact not only upon its immediate setting but also generally upon the theory and practice of "landscape architecture."

Sea Ranch became perhaps Halprin's greatest ecological design demonstration project. His master plan for clustering buildings to preserve natural contours, views and open spaces for common use was put to paper only after the most painstaking scrutiny of the terrain and climate. If today the principles ring of common sense (though they're still too often violated in practice, even at Sea Ranch in its maturing years), at the time they represented a dramatic break with customary my-home-is-my-castle (and damn everybody and everything else) building patterns.

Sea Ranch was also one of Halprin's first superscale collaborative ventures. Using a sympathetic palette of natural woods and shingle roofs, and a build-with-the-wind philosophy they had worked out together, all of the original architects—Charles Moore (SMITHSONIAN, June 1984), Donlyn Lyndon, William Turnbull, Richard Whitaker and Joseph Esherick—won awards for their Sea Ranch projects. Halprin himself earned an Award of Honor from the American Institute of Architects for the Swim and Tennis Club he designed.

Ghirardelli Square was another bold break with convention and it, too, has become a famous model. Comprising a lively, sophisticated combination of older buildings (most notably a 19th-century chocolate factory) with new construction, it was the first of the major center-city success stories to pair preservation with new economic uses. Halprin's contribution may have been the most important part of the puzzle—a site plan that takes advantage of San Francisco's slopes, and a sequence of buildings, stairwells, pathways and open spaces to keep every visitor happily moving. Every visitor, that is, who is not enticed to pause awhile to enjoy the spectacle (and the tremendous views of the bay) from plentiful benches, chairs and sitting ledges.

Embarcadero Plaza, a wide, flat expanse at the edge of San Francisco's dense downtown, is the most open of Halprin's civic spaces. Conceived as a great communal gathering place, it was completed well before the giant buildings filled in behind it, and for years seemed rather too big and isolated. But it was foresightful—it's a necessary counterpoise to the scale of the new downtown and, unique in the city, it stands ready to accommodate all manner of celebratory event. "Every city deserves a space like this," he says, and he and Anna have helped to prove it by staging a number of dance celebrations there. The Embarcadero fountain, an engineering feat (designed in collaboration with artist Armand Vaillancourt), forms a bold, behemoth endpiece to the plaza.

Nearby, in green relief to the plaza's nearly treeless expanse, is Embarcadero Park, another Halprin design with a point to prove: it was molded out of leftover land underneath sweeping freeway ramps, making sculptures out of them. Even though like many San Franciscans he opposed the freeway itself, Halprin, almost alone, saw the potential of the land below it. Later, in Seattle, he performed a similar transformation with the Seattle Freeway Park, except that this time the reclamation occurred above and to the sides of the burrowed, divisive highway. "The trick," he said, "is to perceive the old freeway as a part of the cityscape and tame it, rather than complain about it."

Crocker Court, on top of Bunker Hill in downtown Los Angeles, is another Halprin invitation to harmony.

Coping with the universally unknown

Nicollet Mall was another exercise in urban reclamation, one of the early major efforts (and, far and away, one of the more successful) to return a traditional, decaying center-city street to pedestrians. Besides devising an ingenious, curving, central service roadway, which gave them the opportunity to vary the width of the sidewalk and thus to create there a number of special places, Halprin and company designed all the "street furniture"—light standards, planting pots, clocks, benches, bollards, bike racks. "The office enlarged itself in response to these needs," he recalls. "We had to cope with things we didn't know anything about, and nobody else did either."

It was Lovejoy Plaza in Portland, begun in 1961, that propelled Halprin and his firm into the public consciousness in a big way. Lovejoy was a dramatic, eminently photographable, extraordinarily usable turnabout from the big, featureless plazas then afflicting American cities—a climb-on, walk-through, look-at and listen-to-me sculpted space whose visual, psychological centerpiece (typically a bit off-center) is a

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Freeway Park in Seattle reclaims land above and to the sides of elevated road. Decks and plantings soften concrete visually. At other points of the freeway are water and canyon shapes built overhead. The trick, says Halprin, "is to tame it, rather than complain."

spiraling, cascading waterfall. If few enthusiastic visitors are aware of the motational studies by which Halprin was able to calculate the variety of activities they would enjoy there, all are able to sense the stupendous naturalness of its monumental concrete forms.

Halprin spent weeks in the High Sierra studying rock formations and the movements and sounds of water in a natural habitat (rare is the Halprin park that does not employ water in myriad ways), and vigorously recording them in his notebooks. His idea, he has often said since, is not to imitate the actual forms of nature but to emulate its processes. His success in Portland was galvanic: the Lovejoy fountain was an immediate hit and it remains the most famous image of a Halprin park to this day.

What is less known to those who have not visited the city is that Lovejoy is but a part of a larger entity called the "Portland Open Space Sequence." A block away is Pettigrove Park, as serene as Lovejoy is vivacious, with its green, shaded knolls. Three blocks along this urban sequence—the parks are surrounded by relatively nondescript modern office, apartment and parking structures—is the Ira Keller Fountain, another one of Halprin's stunning, walk-on, waterfall-fountain plazas. This tension-release-tension sequence is typical of Halprin. It also illustrates his formidable persuasiveness: the fountain, completed in 1970, was to have been a parking lot in front of a new civic auditorium until Halprin complained strenuously to the powers that be and, trump, was able to turn it into a notable civic resource.

Still later he added another important piece, the Portland Transit Mall, comprising two parallel, limited-access streets 12 blocks long, in the heart of the city, each with special plantings, pavings and street furniture. To Halprin, the pedestrian-friendly links between the larger parts of the sequence are its most important aspects: "They are a progression of walkways, fountains, little places to sit, benches, plazas—I think that all cities based on this principle would become beautiful cities."

As Halprin's reputation flourished, the firm grew apace; in 1973 he opened a short-lived branch office in New York. But just as his experimental temperament and intellectual interests paralleled the opening up of art forms (particularly dance) in the 1960s, so did his office reflect the decade's strains. The original members of the firm, especially Halprin, continued to make most of the basic design decisions; the younger people, resentful, demanded a more participatory organization. This seemed fair, in view of the philosophy the firm was practicing in its Taking Part workshops. But the resulting reorganization of the firm was an uneasy compromise.

In 1975 Halprin suddenly disbanded his flourishing firm to pursue full time his interests in RoundHouse, a "studio/think tank" with an experimental bent. Not surprisingly, Halprin's time away from the design studio was brief. He reopened his practice in 1978, and the new organization is a tight, familial, ten-person ship of which he unquestionably is the captain. His weathered face has taken on the look of one of his beloved, craggy outcroppings in the Sierra, an effect intensified by his manner of dress—he favors lumberjack checks, string ties, big Western belt buckles. He's

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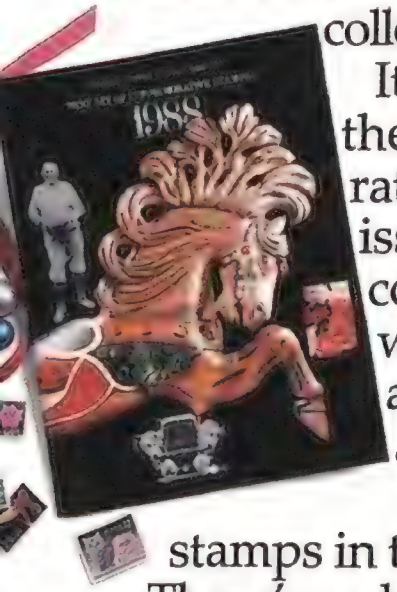

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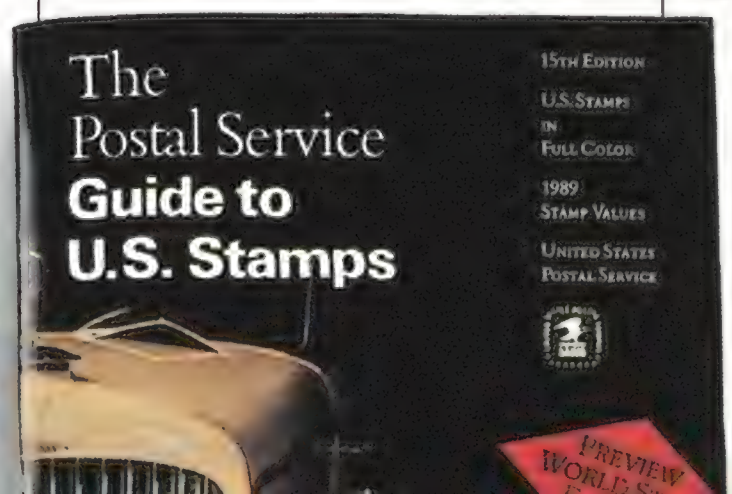

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relaxed, but he husbands his time intently between work, "friends all over the world" and family. (Daughter Daria has two children, Ruthanna and Jahan; daughter Rana also has two, Levanna and Micah. All are frequent visitors to the Halprins' homes.)

One of the projects Halprin undertook with RoundHouse (in collaboration with partner Sue Yung Li Ikeda) was a film about the proposed memorial to Franklin Delano Roosevelt in Washington, D.C., which Halprin had designed in 1975 and which today remains his chief piece of unfinished business. The FDR Memorial, though smiled upon by the relevant federal agencies in the 1970s and approved by Congress in 1982, has not yet been funded.

Designed for the curving western edge of the Tidal Basin, near the monuments to Jefferson and Washington, it combines many familiar Halprin themes—deployment of water as a primary element, the blending of man-made with natural features, the use of up-to-date materials and art, and a flex-and-release sequence of spaces to insure and enhance movement through space. The symbolic focal points are to be four "garden rooms" symbolic of Roosevelt's well-known Four Freedoms (speech, religion, and freedom from want and from fear).

It is, his wife Anna believes, "the most emotional" of Halprin's creations. If so, there are autobiographical reasons. "I went through the Depression with him," Halprin has said, echoing the feelings of many, "and I came out of it with him." By startling coincidence, Halprin was on picket duty aboard a destroyer off Okinawa when he learned of FDR's death. "We wept." Soon after, the ship was hit by a kamikaze plane and cut in half. Halprin was sent to San Francisco on survivor's leave.

Today Halprin is engaged with customary vigor on a variety of major design projects. Commissions under way include a master plan for an 80-acre tract of land (formerly occupied by a Fiat factory) on the outskirts of Florence; a mile-long streetscape with a centerpiece park, designed to bring an endangered form of activity—people walking pleasurably—back to downtown Los Angeles; and, closer to home, an endeavor to change people's attitude toward Alcatraz Island, so that the intrinsic beauty of the place, and not just its grim history as a maximum-security prison, will become apparent—and available—to all.

In Israel (his mother is buried in Jerusalem), Halprin has been almost continuously engaged in one project or another for three decades. ("I think, and I suspect that Larry thinks so, too, that, deeply, he is a Jerusalemite first," wrote Mayor Teddy Kollek in the book accompanying a 1986 Halprin retrospective exhibition at the San Francisco Museum of Modern Art.) His latest work there, completed last summer, is one of his more spartan, spectacular, beautiful creations.

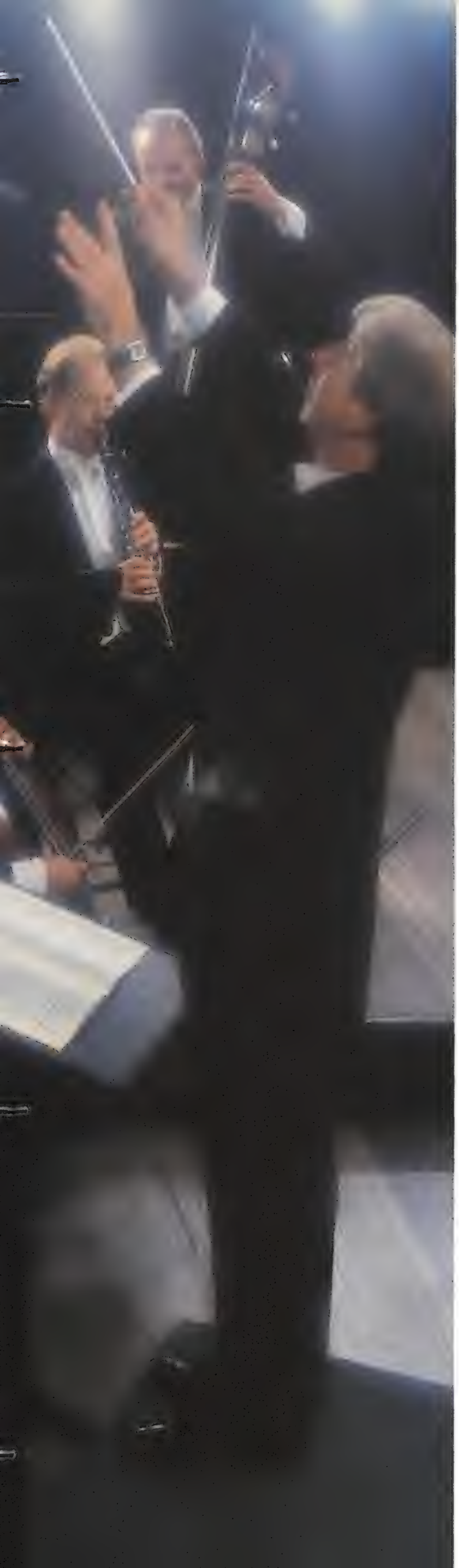
This is the Walter and Elise Haas Promenade, a linear park that follows the sweeping line of a ridge about a mile south of the Old City, overlooking the Dome of the Rock. It is a land hallowed to Jew, Christian, Arab, Muslim. Halprin, with typical sensitivity, designed everything in it—the pathway paved with golden Jerusalem stones, a belvedere, steps, berms, niches, railings, magnificent lampstands—to let the land and the view and the sense of place speak for themselves.

In 1971, performing for himself a task he had assigned others in one of his workshops, Halprin wrote about his own neighborhood (in Kentfield) as, "A redwood house in the woods. Looking at Mount Tamalpais and having it look back at me. Twenty years of living—The footsteps and laughter of my children, the continuity of Ann. . . . The hammock swinging over the woods and then the long drive to the city. . . . The excitement of the city seen across the bay. . . ."

A rich, contented vision, up to a point. But the area is "Anglo-Saxon predominantly" and "upper-middle-class white," where there is "no echo" of his Jewishness and "very few community activities which bind us together except for our common love of the out-of-doors.

"I WOULD LIKE my neighborhood to be," he concluded, using first a visual symbol for interconnectedness and then the words, "interfaces. . . . Through linkages between private and common AND all kinds of diversity of people—ages—heritages." It is the basic vision behind the wonderful, sophisticated spaces Lawrence Halprin has provided for us.

What this boy is doing at the Ira Keller Fountain is exactly what Halprin had in mind when he designed it.



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By James R. Chiles

How we got ready for a war that was never fought

Shocked by Pearl Harbor, Americans rushed pell-mell into civil defense, but attacks on the home front were few and far between

The city of Seattle faced its greatest housing shortage during the manufacturing boom of World War II, when defense workers jammed in by the tens of thousands to build patrol boats and B-17 bombers. Residents filled their spare rooms with boarders, and incoming families waited months for a prefabricated house located miles from their jobs. Yet there was one neighborhood that stood vacant throughout the war. Its location was prime—within easy walking distance of the city's vast aircraft factory. It had three greenhouses, a store, a gas station and plenty of parking. But no one ever lived in any of its 53 houses. Guards would have quickly ejected anyone who tried.

The village, all 26 acres of it, was camouflage that covered the roof of a Boeing bomber factory. Locals called it "Wonderland." Built to deceive bombardiers flying at altitudes of at least 5,000 feet, its houses averaged only four feet in height and the 300 trees wore chicken-feather leaves (p. 176).

Wonderland was one small part of a nationwide convulsion that began with the attack on Pearl Harbor on December 7, 1941. In that one cataclysmic day, Japanese airplanes and warships seemed to strip our nation of an ocean barrier once believed impassable. Over the next year we worked desperately to erect Fortress America. Guerrilla squads drilled in Oregon; cannon and mines were set in place to defend major harbors; millions of civilians, criminals as well as movie stars, enrolled as air raid wardens, bomb disposers and aircraft spotters. Children walked the streets as junior fire marshals and drilled in schoolyards as junior commandos.

The hasty defenses—clustered mostly on the coasts—were not in vain, even if dive-bombers never appeared in great waves over San Francisco and even if the German battleship *Tirpitz* never shelled the docks at Newport News. In 1942, after U-boats began sinking scores of freighters off the East and Gulf coasts—almost pinching off our help to Britain—the U.S. Navy and Coast Guard, and civilian volunteers turned out to hunt them down. Shore patrols, alert for amphibious landings, discovered a raftful of German saboteurs on a Long Island beach.

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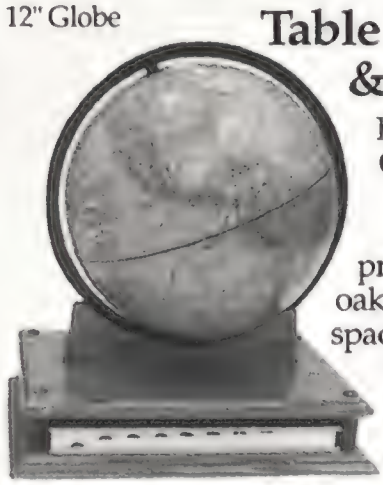

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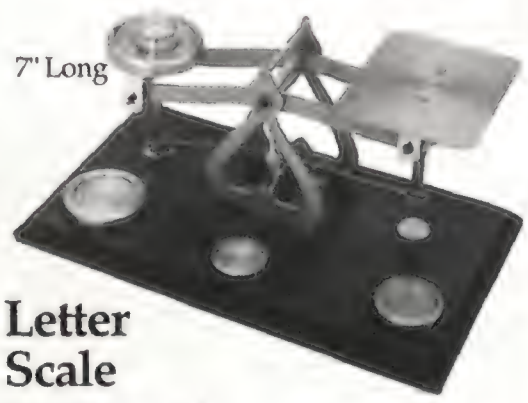

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All told, the country passed through five distinct stages between 1939 and 1945—from complacency to raw fear, to impromptu measures, to manning fortifications and, finally, to dismantling the defenses.

Begin with 1939: Germany's invasion of Poland in September prompted Britain and France to declare war. We started helping with shipments of arms and supplies, and later with patrols to protect ship convoys crossing the Atlantic. America remained at least half-neutral, however. There was a deep isolationist feeling that we should not risk involvement in another European fight. But in 1940 Hitler's armored divisions overran Belgium, the Netherlands and most of France in a month. The British Army barely escaped total disaster at Dunkirk. That summer more than a thousand German bombers rained destruction on England.

If Britain fell, we would stand alone. It was time to consider our defenses. President Franklin D. Roosevelt called up the National Guard and secured the right to start building up the military with a draft. The U.S. Army began to grow from its original 167,000 men, but making it work was another matter. As late as the summer of 1941 an extension of the draftee period of service passed the House by only one vote. This was still the tag end of the Depression. Guns or butter was not the name of the game; there wasn't much of either. Factories required months to retool from refrigerators to cannon. Even in 1941 during Army maneuvers, soldiers tossed eggs instead of grenades, aimed wooden guns and marched down country roads in tight groups of five, each group pretending to be a tank. If someone had attacked the West Coast, we had ammunition for only a few days of resistance. In early December 1941, there were only 45 modern fighter planes available on the whole coast. The only antiaircraft guns ready to defend Seattle were on board warships that happened to be drydocked there for repairs.

But why worry? We had two great oceans to shield us, guarded by two great armadas, the Atlantic Fleet and

A camouflage village, complete with trees, 53 plywood houses and painted-burlap lawns, covered 26-acre Boeing plant in Seattle.

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German subs threatened Atlantic Coast. This is one of few captured intact.

the Pacific Fleet. Most of our Pacific Fleet was moored in Hawaii, an excellent base from which to cut off any attempt to invade the West Coast. If Britain held, there was a chance of riding out the war as the arsenal of democracy.

Then, in one day, we lost an ocean. Of the eight battleships docked in Pearl Harbor that long ago December, Japanese warplanes sank or knocked out five and damaged the rest. We lost ten smaller warships. More than 2,400 servicemen and servicewomen drowned or burned or were blown up. And suddenly anything seemed possible. Bombers over Los Angeles. Sabotage by fifth columnists. Even Japanese carriers off the mainland. Years before, one American military theorist, Homer Lea, had predicted a Japanese surprise landing on the West Coast. Lea concluded in 1909, and many Army men agreed in 1941, that the United States could not immediately repel a well-executed landing. Defenders would have to fall back to

James Chiles writes frequently for SMITHSONIAN *on subjects including codebreaking, automobile junkyards.*

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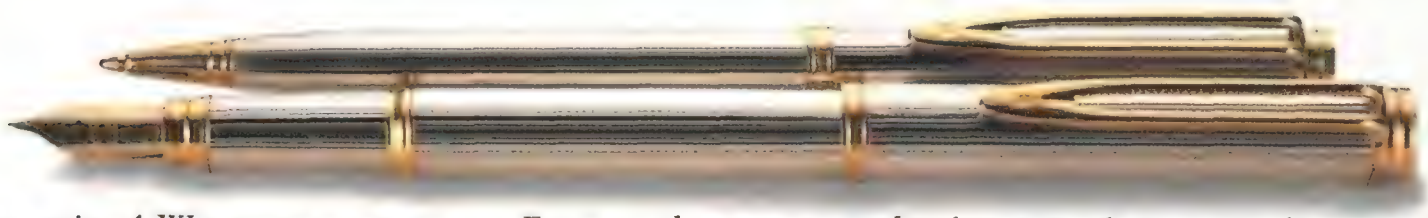

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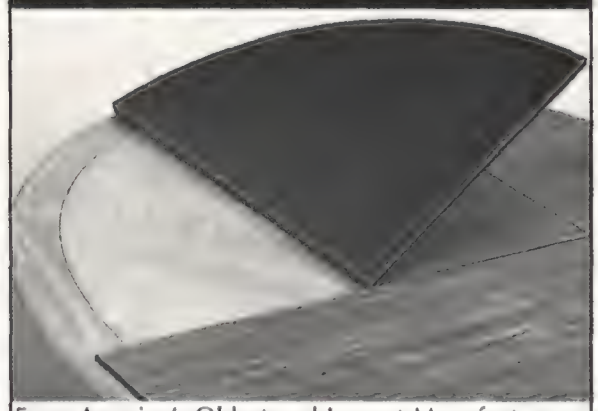

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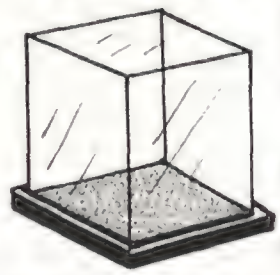

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SM

the Rocky Mountains and fight a protracted war. We began preparing for the worst.

First on the list was protecting the White House. When Secretary of the Treasury Henry Morgenthau heard of the attack he "screamed as though stabbed" and ordered a doubling of the White House guard, and later doubled it again. He also wanted machine guns for the entire White House staff, including the secretaries (he didn't get them). The President spent the afternoon of December 7, and most of the evening, meeting with military men, his Cabinet and Congressional leaders. By the time Roosevelt joined newsman Edward R. Murrow for a late-night sandwich, the White House was ringed by armored cars and antiaircraft guns. Work got under way to convert a storage vault deep below the Treasury Building into a Presidential bomb shelter. Said Franklin Roosevelt to Henry Morgenthau, "I'll only go down there if you let me play poker with all your gold." The Secret Service hunted for an armored limousine; the best it could produce on short notice was a car

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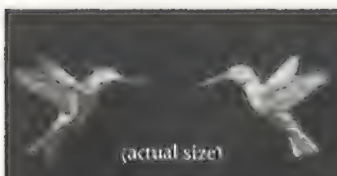
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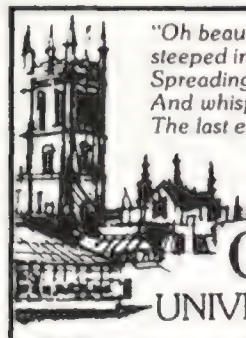

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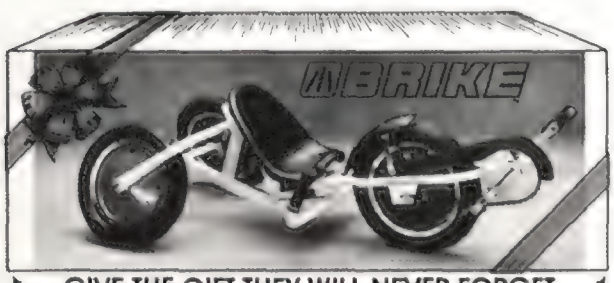

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Japanese balloons that carried bombs reached USA but did little damage.

once owned by gangster Al Capone.

If the nation's nerve center was quickly shielded, near-panic ruled elsewhere. The Pacific Northwest was typical. On the first night of Seattle's citywide blackout, a crowd gathered downtown under a bright blue neon sign accidentally left on at the Foreman and Clark Clothing Store—"drawn like moths to a flame," recalls Henry MacLeod, then a city editor at the Seattle *Times*. The crowd smashed the sign, and several thousand people went on to break more lights and windows over a six-block area. A young woman arrested by police as a ringleader said, "If I had to do it again, I'd do it the same way. That is my patriotism." Ugly rumors spread that rowdies were looting stores.

"We felt so vulnerable," explains David James, then a newspaperman in nearby Tacoma. "It took months to realize we could hold our own."

The first priority was arming the West Coast on a crash basis. Weapons and men started to move West immediately: railway guns from Rhode Island by fast passenger and mail trains; 110 twin-boomed Lockheed P-38 fighters from Michigan; bombers from the Southwest. The Army com-

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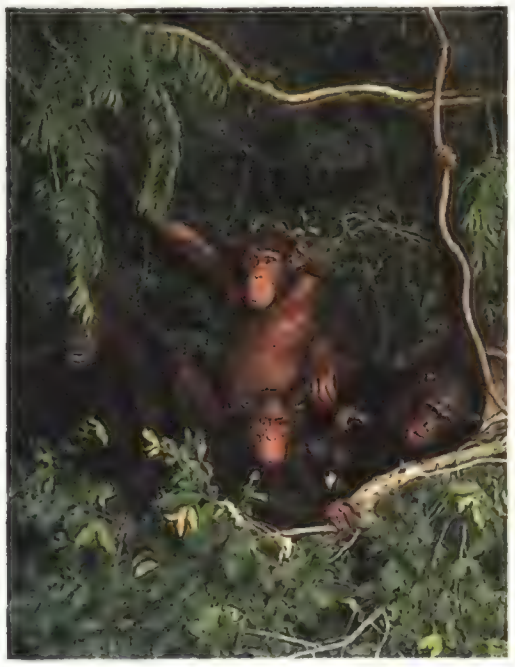

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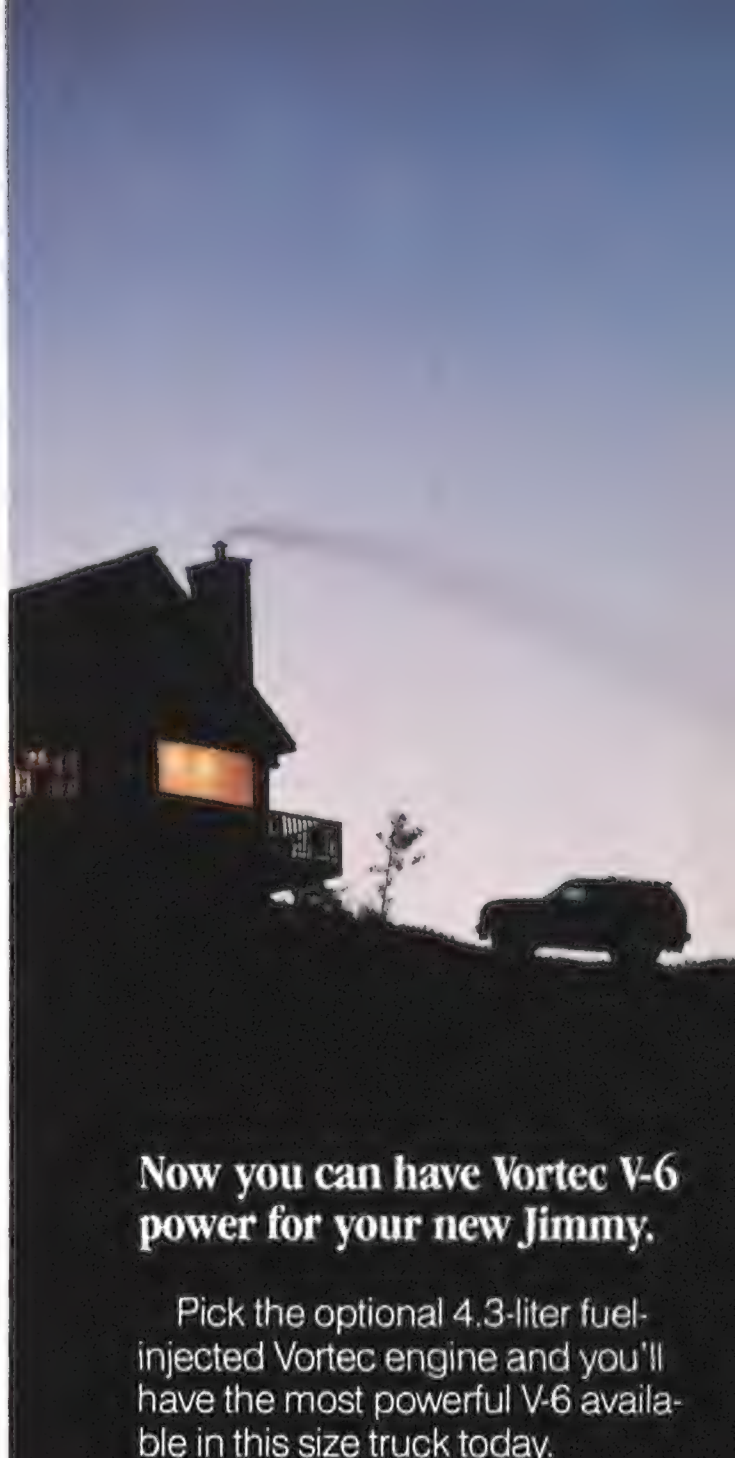
mandeered 100 lend-lease fighter planes already dressed with the Royal Air Force bull's-eye, and recalled a ship bound for the USSR loaded with new antiaircraft guns. By the end of January 1942, there were more than 250,000 troops on the West Coast. They pulled submarine nets across harbor mouths, seeded mines in shipping channels and practiced firing the heavy guns that overlooked the major harbors. So many planes moved West that by February only 17 fighters—11 of them obsolete—were on hand to defend New York City. (If it was any comfort to Manhattan, Congress was no better defended than New York. One weekend in February 1942, Congressman Harold Dunbar Cooley from North Carolina climbed to the roof of the House Office Building in Washington and discovered that all the "machine guns" were made of wood and the "soldiers" were decoys stuffed with straw.)

During the first week of war the military had little reassurance to hand out to the public. They were too busy passing along false alarms. "There are more damned fools in this locality than I have ever seen," an excited Army general, John L. DeWitt, told a San Francisco audience irritated by three air raid alerts the night before. Enemy aircraft had flown over the city, the general kept insisting; "Death and destruction are likely to come to this city any moment." In fact, there had been no enemy planes. On December 9 an offshore patrol reported 34 Japanese warships off California; but a more careful check revealed 14 fishing boats. Each day brought new reports of enemy ships.

Easterners, meanwhile, had their minds on Heinkel bombers. On that same day in December a citizen's phone call to an Army headquarters in New York Harbor was somehow garbled into an official warning that German warplanes were to arrive at 2 P.M. The Northeast went on alert at 1:25 P.M. Radio stations left the air so enemy navigators would have no signals to follow. In New York City, millions of schoolchildren were sent home. Near Boston, police opened emergency stocks of guns and ammunition and shifted them to outlying stations. A nearby shipyard sent home

Chiefs of the new Office of Civilian Defense, Eleanor Roosevelt and fiery Fiorello La Guardia, Mayor of New York, showed more zeal than sense.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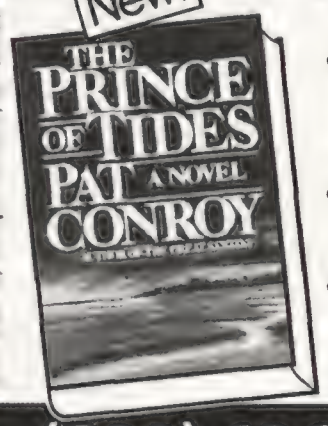

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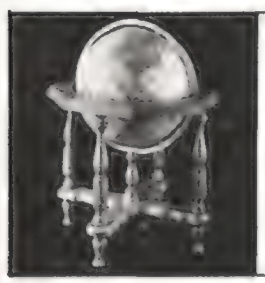

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German saboteurs got ashore from a sub with explosives but were caught when betrayed by one of their number, George Dasch (top left).

the entire day shift of 14,000 workers.

Another false alarm sounded during morning rush hour the following day, and thousands of New Yorkers paused outside to gape briefly at the sky, then hustled on to work. Because Pearl Harbor was so unexpected, "the general public was willing to believe anything and everything about the enemy," says David James. Hate-driven rumors, later proved false, swept the Northwest: Japanese sympathizers had planted arrow-shaped fires on the Olympic Peninsula to point the way to the Boeing plant. Or was it fields of mustard plants aiming at Seattle's Sand Point Naval Station? In fact, there weren't any beacons. Although there were a few traitors among them, Japanese-Americans were extremely loyal throughout the war, even after being cruelly uprooted from the West Coast by the government and sent off to relocation centers.

Within weeks, panic ebbed and something nobler replaced it, a rare feeling of common purpose. "Now," says James, "the big question was, 'What are you doing for the war?' " When local civil defense organizations didn't move fast enough, thousands of Americans pulled their rifles from closets, donned khaki shirts and improvised arm bands, organizing themselves to defend their neighborhoods. As a 9-year-old, James Covert, now a history professor at the University of Portland, in Oregon, memorized silhouettes of enemy warplanes in his fourth-grade class. "Everybody had a job to do," he says. "But what was there for kids?" So, inspired by tales from newsreels and visiting servicemen, he found himself a job.

Covert and his neighborhood chums formed a squad of junior commandos with the rakish name of Lucky 13. They dressed in World War I military clothes and designed their own insignia. At night they smeared mud on their faces, prowling the neighborhood to check for trouble. They toughened themselves with five-mile marches. They swung

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from tree to tree on ropes. They scaled three-story drainpipes and squirmed under barbed wire while one boy fired a pellet gun over their heads. Lucky 13 clashed regularly with other such squads in meticulously planned war games, hampered only by the fact that nobody wanted to play Japanese soldiers. "We all had hunting knives, and some had BB guns and .22 rifles handy at home," says Covert. "There was this feeling in the back of our minds that if the Japanese ever came to our neighborhood, we'd be ready."

Thousands of Oregon men joined gun-toting guerrilla bands. One, calling itself the Tillamook Guerrillas, was commanded by Stewart Arnold, a blind veteran of World War I, assisted by his seeing-eye dog, Mac. Tillamooks dug foxholes in the hills and planned how they would evacuate dairy herds by driving the cows deep into the woods. They also watched for enemy aircraft, helped bring in the harvest, patrolled the woods to prevent forest fires and studied how to blow up strategic tunnels and bridges.

This time of self-help, rising unbidden from neighborhoods and farms, didn't last long. State and city governments quickly took over with

Air raid warden shows a housewife how to black out her kitchen windows.

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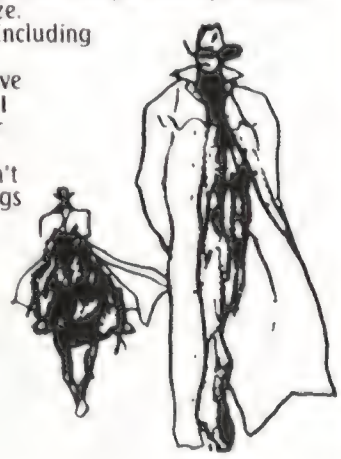

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their own civilian defense councils, and plenty of forms in triplicate. Trying to keep track of the millions of volunteers and thousands of local headquarters was the Office of Civilian Defense (OCD) in Washington, D.C. which FDR had created in May 1941. Fiorello H. La Guardia, a former pilot who was then Mayor of New York, was director; First Lady Eleanor Roosevelt was his assistant. La Guardia was not known for a cool head. On the day of Pearl Harbor, he had cruised his city's streets in a loudspeaker-equipped car and yelled "Calm! Calm! Calm!"

This spunky pair, full of enthusiasm and underbaked ideas, attracted abuse from every point of the compass. Leading clergymen rose in fury over a suggested sermon outline honoring Civilian Defense Week that La Guardia mailed out to them. New Yorkers complained about the constant absence of their mayor. People

Patrolling darkened streets, wardens had helmets, nightsticks, whistles.

ridiculed the OCD's physical fitness division as a hodgepodge of good intentions staffed by friends of Mrs. Roosevelt. Jobs included coordinators of bowling, table tennis, horseshoe pitching and canoeing. Press and public unhelpfully suggested hiring coordinators for such things as crap shooting, gin rummy and loafing. By February 1942 the criticism was so withering that La Guardia, the First Lady and many of her protégés left the OCD. The agency then concentrated on supplying local offices with vital equipment: thousands of fire pumps and miles of canvas hose, helmets and gas masks by the million. It also ordered up a monster 115-horsepower air raid siren, the Victory Siren, for large cities; it was capable of breaking eardrums at a hundred feet. Tested in New York City, it was audible for 74 blocks. The Army even considered using one to stun the invading enemy.

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little to discourage the legions of civil defense volunteers—at peak strength, more than ten million of them. They drove trucks, trained as auxiliary firemen and learned to douse phosphorous firebombs with sand and water. They studied first aid and how to neutralize poison-gas burns (with bleaching powder). They collected fingerprints by the tens of millions and sent them to the FBI. They put on war-oriented public demonstrations. One extravaganza in Seattle featured a miniature town erected in a stadium. Thirty thousand spectators watched as dive-bombers swooped in to set the tiny town ablaze. The planes were quickly followed by civil defense volunteers using the latest techniques to handle the fires and bombs.

Most visible were the block wardens, in bright steel helmets. (After the war it was discovered that the helmets did nicely, upside down, as pots for pansies and marigolds.) Carrying whistles and nightsticks, wardens patrolled streets, rattled doorknobs and browbeat homeowners who failed to turn off lights or draw heavy blackout curtains. Occasionally, zeal carried them away: in Glendale, California, one got so indignant at an empty house ablaze with lights that he smashed in the back door, went in and turned them off. The outraged owners charged him with breaking and entering.

Kent, Connecticut (pop. 1,240), girded itself for firebombs and for a stampede of refugees from coastal cities. Five out of every six Kent residents had signed up as civil defense volunteers; half the townspeople qualified as firefighters. The chairman of the local defense council, James Humphreys, began his work by ordering a census of every useful item in the town, complete to every cow, chicken, horse, rowboat, pair of crutches, cot and shotgun. "We were ready to acquire several thousand refugees," says Humphreys, now 93. During the day he was a Latin teacher and athletic coach at the Kent School. "No bed till 1 A.M. in this house," he used to say.

Equally ready were the 1.5 million volunteers of the Army Air Forces Ground Observer Corps, who searched the skies for enemy planes from a

Rare bombardment from a Japanese sub occurred off Fort Stevens, Oregon, on June 21, 1942; it hurt no one but left shell holes like this.

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picket line of 15,200 posts (spaced roughly six miles apart) all along the East, West and Gulf coasts. Most sites had at least two observers on duty at all times. Typical was Ed Wyatt of Lewes, Delaware. By day he worked as a carpenter, building a new gun emplacement overlooking Delaware Bay. Then, depending on the day of the week, he either drove a cab or watched for airplanes till 2 A.M. at a post four miles from home. "I worked darn near 24 hours a day," he says.

Aircraft observers were perched in wooden lookout towers, the Empire State Building, snug cottages, old buses and remodeled water tanks. They nailed wooden shelters to courthouse roofs and church steeples. The shelters were made of lumber bought with penny donations, and the proceeds from square dances and scrap drives. Where the country was too wild and remote to provide enough volunteers, the Coast Guard and the Forest Service did the observing and built hundreds of additional posts.

Some of these remote posts were trim, glass-walled cubicles erected from prefab parts hauled in on horseback. But one in Washington State, recalls retired forest ranger Harold Chriswell, was only a bare spot on a peak so steep that to reach it the observer had to climb hand over hand up a telephone line. Remote observers often would stay on the job for months at a time before relief arrived.

The observers came from every layer of life. Stage and screen stars Helen Hayes, Henry Fonda and Ward Bond volunteered. Inmates at California's Folsom Prison watched from inside their walls. *New Yorker* cartoonist Perry Barlow kept watch from his studio in Westport, Connecticut. But many observers arrived with more enthusiasm than expertise or military rigor. A spotter called in a Navy blimp as "one submarine flying high." Another described the twin-boomed P-38 as "two planes with their arms around each other."

Every post had a telephone line or radio connection. Upon hearing or seeing any kind of aircraft, a spotter grabbed the phone, yelled "Army Flash!" at the operator and reported details. At the major information centers, workers marked large maps and boards with pips and flags, and tried to match the sightings with registered flights. It was a loose-jointed system, overloaded with reports about American planes on training flights, but somehow it worked. On the only two occasions when an enemy plane actually appeared over the U.S. mainland, Forest Service spotters reported it. Both flights were by the same Japanese Glen seaplane, which dropped firebombs on the Oregon forests. (Some fires were started, but they didn't spread.) The plane crossed the Pacific folded up and stowed in a makeshift

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A cold wind shivered outside their window, but it could never reach them. They were

In Manhattan, air raid wardens practice rolling out auxiliary firefighting equipment, commandeering a taxi to haul it.

hangar aboard the submarine *I-25*. It was launched off the California-Oregon border on September 9 and 29, 1942. Though it had rising suns on the fuselage, the warning network did not react to the reports, thinking the spotters were calling in stray American patrol flights.

Nevertheless, submarines continued to be the enemy's chief means of bringing (or trying to bring) the war home to America. In February 1942, the Japanese sub *I-17* opened fire on beachfront oil wells in Southern California, causing minor damage. The main result was to so alarm Los Angeles that one night later, very much in the style of Steven Spielberg's film farce *1941*, antiaircraft batteries all around the city responded to a false alarm by firing off more than a thousand thunderous rounds at nonexistent planes in a spectacular fireworks show witnessed from streets and rooftops by hundreds of thousands of residents.

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The Japanese bombardment resumed on June 21, 1942, when the sub *I-25* loosed 17 shells in the general direction of Fort Stevens, Oregon. It was the first attack on a mainland military base since the British failed to take Fort McHenry in 1812, thus inspiring "The Star-Spangled Banner." One shell hit the backstop of the fort's baseball diamond. Another narrowly missed a farmhouse, exploding in a nearby swamp (p. 190). The incident "made us kids a lot of money," recalls Myrle Hitchman, who was sleeping in the house at the time with his brothers and sister. "Next day, people came from all over looking for souvenirs. So we took all the scrap iron on the farm and broke it up, ran the pieces through the forge to give them a blue cast and sold them at a buck apiece as 'genuine Japanese shrapnel.'" Hitchman laughingly recalls, "I was making more money than my old man."

Out of all the scattered Japanese attacks on the mainland, the only fatalities resulted from a bomb carried by a balloon. Bomb-bearing balloons started arriving in November 1944. Launched from Japan to ride the eastbound jet stream, most of the 6,000 balloons were of glue and paper, about 30 feet in diameter and inflated with hydrogen. Five small bombs dangled beneath each balloon. None of the bombs is known to have set any serious fires, but on May 5, 1945, one killed six people on a fishing trip near Bly, Oregon. Dead were Elyse Mitchell, the wife of a local minister, and five children from the church school. Until that tragedy, virtually no news of the balloon bombs had been allowed to reach the newspapers or radio.

Much more dangerous were the German submarine attacks on American shipping along the Gulf and East coasts. Adm. Karl Doenitz tried to cut America's lifeline to Britain and in 1942 nearly succeeded. In the first five months of that year, U-boats sank more than 120 ships. For awhile, we couldn't replace them fast enough.

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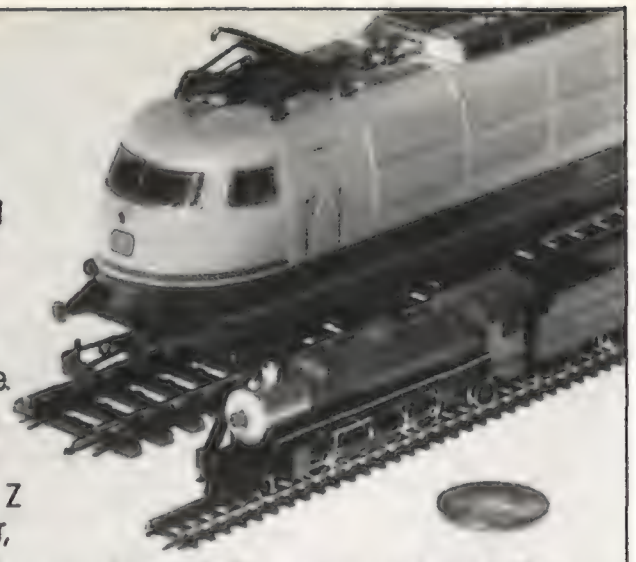

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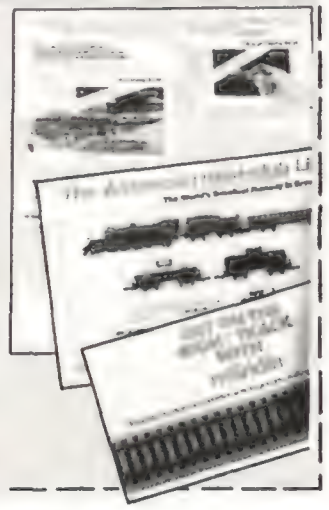

Gummy brown bunker oil from dying tankers piled up ankle-deep on beaches once packed with sunbathers, but now fenced off and walked only by armed patrols. "Plenty of wreckage washed ashore," says Robert Lamme, who was a Navy fire chief at Port Everglades near Fort Lauderdale, one of many small naval bases set up in Florida to fight the submarines. He remembers seeing, among the flotsam and jetsam washed up on the shore, stalks of bananas, barrels of rum and once—an eloquent statement of the desperate battle—a life raft riddled with bulletholes. Bodies of merchant seamen and the sailors sent to help them regularly arrived on the tides.

Military and civil authorities told the public little about the losses, but it was impossible to hide the attacks. Like sharks, the U-boats often engaged targets within swimming distance of the beach. One time, in early spring 1942, Lamme watched from his base's mess hall as a Texaco tanker left the port. A few minutes later, he remembers, "we were brought to attention by the sound of gunfire. A sub was attacking with its deck guns. We could hear the guns firing—and feel the ground shaking. The tanker had its own gun too, and was swapping shots." The sub finally dropped away for easier prey.

Operations at Lamme's base were typical. It was equipped with an odd variety of motor patrol boats and millionaires' yachts. The yachts, borrowed for the duration, went out to seek the enemy—teak decks painted dull gray and brass fittings removed—carrying almost-useless machine guns.

For months all we could do to the U-boats was harass them. We borrowed trawlers from the British to pursue them. We sent out volunteer pilots of the plucky Civil Air Patrol to find them and, occasionally, to bomb them. As time went on, the Navy was able to take over this volunteer work with big, twin-engine flying boats, the PBM Mariner and the PBY Catalina. These slow, heavily armed craft could

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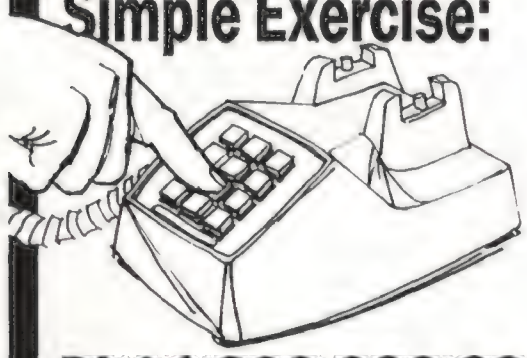

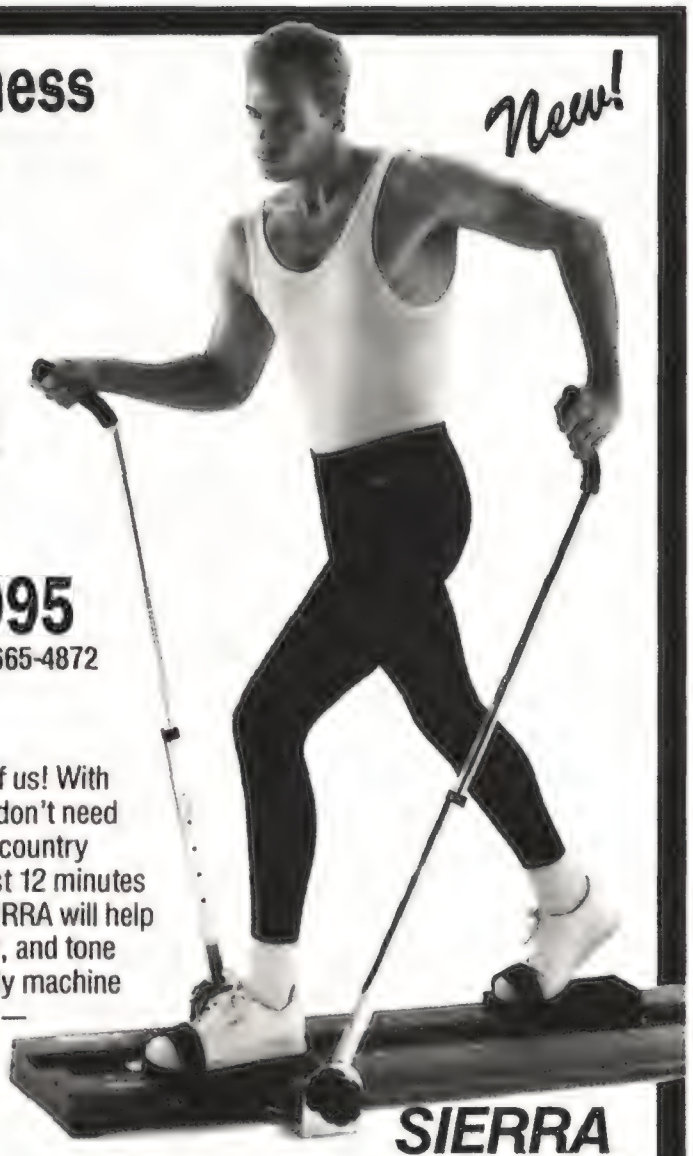

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After catching Nazi saboteurs, FBI dug up four boxes of explosives.

patrol for hours, pick up rafts full of torpedoed sailors and batter a sub while destroyers rushed to the scene. Attacks went on for another year, but the U-boats had lost their killing edge.

Some U-boat commanders turned to other tasks. They mined a few harbors and, in June, landed the only German "troops" to attempt an attack on the American mainland. The landing was called Operation Pastorius. On June 13, 1942, four saboteurs came ashore on a Long Island beach, followed some days later by four who landed south of Jacksonville, Florida. On paper, operations like Pastorius held considerable menace for the factories, rail lines and bridges of America. The men brought waterproof cases holding explosives, firebombs and $174,000 in cash—enough, they reckoned, to create industrial havoc for several years. All the saboteurs had once lived in the United States; two were American citizens. In Germany they had been trained in demolition, secret communications and espionage, and were given false identities.

The Germans soon ran into serious problems. Right off the bat, an unarmed Coastguardsman caught the Long Island team landing on the beach. Coastguardsman John Cullen, walking a routine, midnight beach patrol, asked their business. The quick reply was that the group had come ashore from a grounded fishing boat. But they declined to follow him to the nearest Coast Guard

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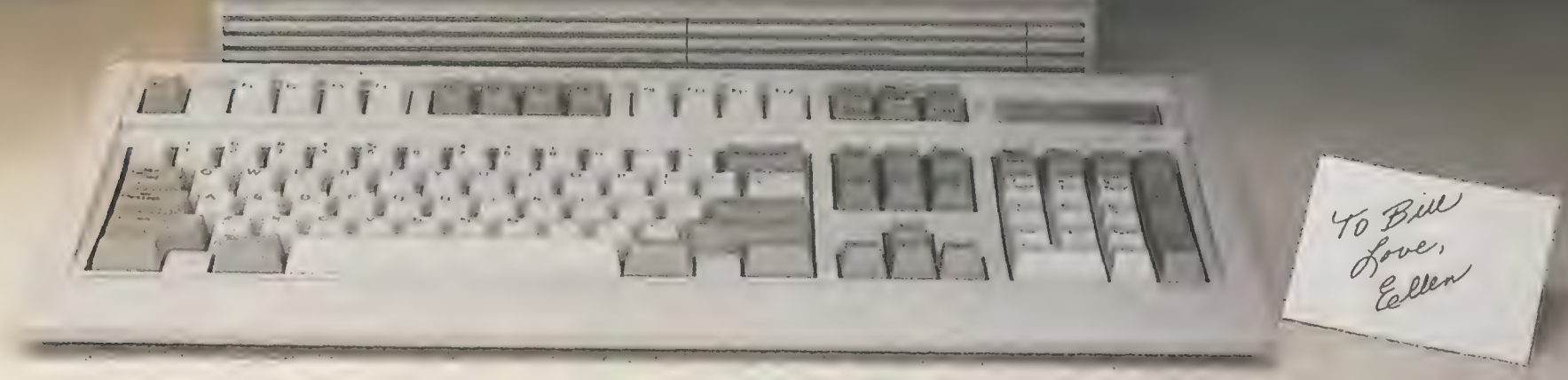

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station and one even offered him a bribe to forget the whole thing. Cullen took the money to allay suspicion and ran to the station for help. By the time more Coastguardsmen could get to the beach the Germans were gone, but digging revealed an arms cache. Now the saboteurs' basic aim was exposed. The men dispersed safely to New York, but one of the leaders decided to tell all to the FBI. The turncoat, George Dasch, even convinced another of the commandos to help him. Dasch, born in Germany, had spent many years in the United States, working as a waiter in New York City and even serving in the Army at one point. He had married an American. In 1941 he returned to Germany, but took with him enough emotional ties to America to cripple his career as a saboteur. After the roundup, Dasch and his co-informer were given prison sentences, and the other six died in the electric chair.

By June 1942, areas once vulnerable to attack were now heavily defended. Informed that ships carrying nine-tenths of the nation's iron ore passed through the locks of Michigan's Soo Canals, the Army moved in 7,000 soldiers to protect the gates, and set up a string of radar stations and aircraft observers across the province of Ontario to watch for bombers and paratroop drops. The Coast Artillery floated barrage balloons around key Western shipyards and factories. These big rubber gasbags, intended to discourage dive-bombers, escaped occasionally and blundered downwind, dragging steel cables, now and then wreaking havoc.

Wary of retaliatory air strikes by the Japanese after Gen. James Doolittle's April 1942 carrier-launched bombing raid on Tokyo, the Army doubled its West Coast fighter and bomber force during May. Twenty thousand more soldiers arrived on the Coast. Aircraft factories dispersed their planes, camouflaging them in outlying fields. Washington rushed 600,000 gas masks to Western cities, handing them out

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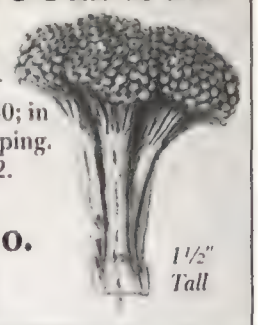

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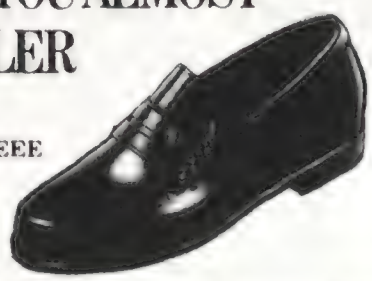

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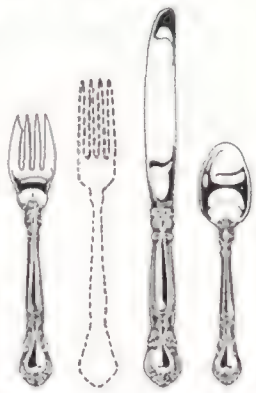

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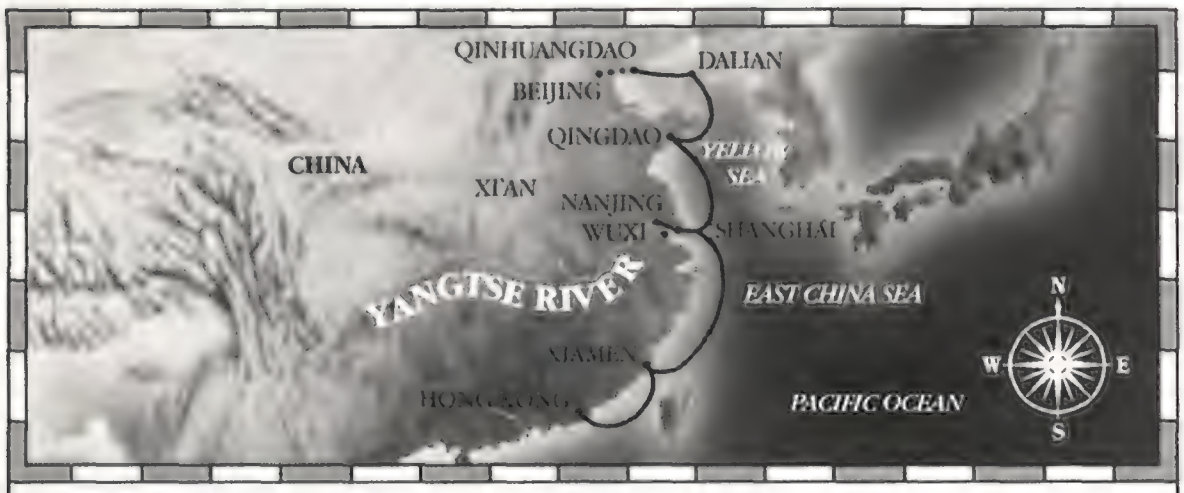

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By the time Wozniak's battery left Sunset Avenue in 1943, the Battle of Midway was over and the Japanese fleet was in retreat across the Pacific. It was also obvious that Germany couldn't place capital ships or bombers within a thousand miles of the American coast. So Americans began gingerly to dismantle their defenses. The Army pulled cannon from coastal forts and melted them down for scrap. Coast Artillery gunners were retrained as antiaircraft gunners in Virginia. The OCD, meanwhile, was desperately trying to figure out what to do with 10.5 million lengths of fire hose, 4.6 million gas masks and 2.7 million helmets stamped out of old car fenders.

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(signed) Carey O. Randall
Associate Publisher, Administration

a police captain afterward, "like running around picking up live wires and fixing gas leaks." The Ground Observer Corps sent its spotters home for good in May 1944. The posts were left to crumble under the assaults of lumber scavengers and rain. Plans to remove Wonderland, Seattle's camouflage village on the roof of the Boeing plant, were in progress before Japan surrendered on August 10, 1945.

Not much is left to remind us of the Battle of America, a battle that never happened. Near Seattle is an anchor for a submarine net; tubular towers built to house the gunnery officers who called the range for the 16-inch guns at Fort Miles stand watch over Delaware Bay. The fort itself is now in a state park. The swimming pool of the luxurious San Luis Hotel in Galveston, Texas, rests on the roof of a massive concrete gun emplacement. And just off the Atlantic coast lie the sunken hulks of U-boats and the freighters lost to German torpedoes. It was as close as we ever came to fighting the Battle of America.

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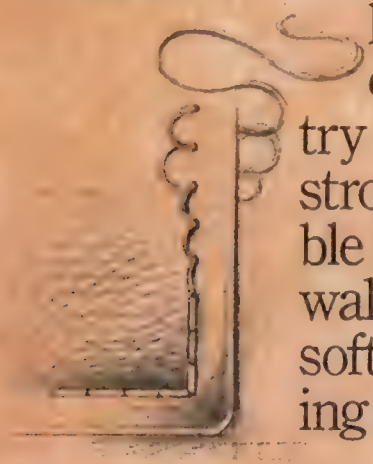

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Book reviews

Gumshoe
Josiah Thompson
Little, Brown, $17.95

Rare is the detective who quotes Kierkegaard and Hegel. Odd is the philosopher who legitimately fears that someone may have bugged his car. Josiah Thompson is both of these fellows, a professor who for the past 11 years in San Francisco has practiced the métier of Lew Archer and Sam Spade.

A graduate of Andover and Yale, Thompson chafed within the confines of academe long before engineering his midlife career shift. While teaching philosophy at Haverford College, in Pennsylvania, he steeped himself in the Kennedy assassination and wrote *Six Seconds in Dallas*, a trenchant critique of the Warren Commission Report.

Gumshoe, Thompson's memoir of his early years at the keyhole, skimps on the motivation behind his dramatic change in course. He cites staleness in his marriage (which has subsequently refreshed itself) and a depression stemming from the conviction that he and his professorial colleagues "were all parodying ourselves," a thought that had struck him after a faculty meeting. But why an erudite man should exchange leisurely days of teaching and reflection for wearying nights of surveillance from a parked car is a question Thompson does not address.

No matter. The book's narrative drive is such that the reader finds himself scheming to outwit trouble and being engrossed in problems of procedure. For example, there is the perennial dilemma of whether to inform local police of a stakeout and risk a leak to the subject, or keep them in the dark

and court arrest for trespass or Peeping Tomhood. Thompson sometimes errs on the side of nondisclosure—and on occasion has been duly arrested for his calculated lapses.

Early in his flatfoot career Thompson snooped on some alleged industrial saboteurs, but the case petered out. Now most of his cases are domestic disputes of one sort or another—a kidnapped child, an adulterous spouse, a palimony-seeking former lover. All of which confront him with humanity at its mundane and dreary worst.

Another drawback of the profession is its propensity to warp the personality. Dashiell Hammett, an exemplar for Thompson (the creator of Sam Spade worked as a private eye himself) understood the job's hardening effect on anyone who practices it skillfully. A good detective, in Hammett's words, is "able to get the best of anybody he comes in contact with," a formula that plays havoc with the openness and vulnerability required for love.

Thompson's "case de résistance" involved the recovery of a snatched child removed to India—an operation that called for meticulous planning, reliance on an Indian detective who scheduled his moves with an eye on the astrology charts, and a willingness to suspend legal scruples. The mission was a whopping success, as is the author's tongue-in-the-vicinity-of-cheek writing about it: "She was like an actress auditioning for a part she knew she wouldn't get," he says of the child's listless American mother; "the world had hurt her and hurt her again, and she was getting tired of even pretending it wouldn't keep on hurting her." The part might have been tailor-made for Barbara Stanwyck, but the case, Thompson assures us, was discouragingly real—an instance of life imitating genre fiction.

One feat that life seldom manages is to satisfy the yen for an ending, something that fiction readers expect—and get. Admirably, Thompson intervenes with an epilogue that provides follow-ups to his cases. It is gratifying, for example, to learn that a Korean-American whose conviction "stank" is now, thanks to Thompson and others, a free man after nearly ten years in prison.

One's chief misgiving about *Gumshoe* is that the author has omitted man-years of ennui and frustration—when surveillance proved fruitless, leads went nowhere, bad coffee left a taste in the

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mouth like bile, and the correcting of philosophy papers must have seemed scintillating by contrast. Yet similar conditions are part of most jobs, and perhaps not even a fact writer should enslave himself to truth.
Dennis Drabelle
Washington writer

Mary McCarthy: A Life
Carol Gelderman
St. Martin's Press, $24.95

The satirist and scourge best known to readers of Mary McCarthy's vivid fiction, criticism and reportage is only intermittently present in this otherwise fine literary biography, a replete and specific portrayal of the energetic woman whom Gelderman calls a "neoclassicist in a country of romantics."

The facts of McCarthy's life are indeed consistently unconventional. Born in 1912, she was orphaned with her three brothers when their parents died during the influenza epidemic of 1918. Mary was brought up and educated by a succession of kindly relatives and Dickensian monsters (the latter being the unforgettable Aunt Margaret and Uncle Meyers, whom she would picture so unsparingly in her brilliant *Memories of a Catholic Girlhood*).

She enjoyed academic success at Vassar and early literary renown as the author of a feisty series of accusatory articles on "Our Critics, Right or Wrong" (in the *Nation*, in 1934). Her "initiation into the political left," also in the 1930s, bred a lifelong commitment to liberal activism—and also led to her stormy unions with the prototypical leftist journal *Partisan Review* and with critic Edmund Wilson (the second of her four husbands, father of her son).

During the '40s and '50s McCarthy taught (mainly at Bard College), wrote (most notably, for the *New Yorker*) and further developed her skeptic's-eye view of American culture and her "reputation as a literary duelist." In 1963, the commercial success of her novel *The Group* brought "celebrity status." And, extending into the 1970s, McCarthy's "six-year attempt to awaken the American public to the human realities of Vietnam" was distinguished by her passionate Orwellian objections to the casual use of "language that obfuscated the reality of war." Worst of all, she said, "is the terrible removal of morality from the whole affair by this separation of words from their meaning."

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Contrasts and tensions have been continually aboil in McCarthy's private and public lives. She's a social conservative who distrusts modern technology and mourns the "disappearance of old-fashioned domesticity." Never a stay-at-home, however, she has traveled widely—and well—and has organized groups of kindred intellectual spirits to go to trouble spots such as Southeast Asia and place themselves in the spotlight, and often in genuine danger.

McCarthy's fearlessness also takes the form Gelderman calls an "urgency to tell the whole truth as she sees it, about herself and others, no matter what the consequences."

Carol Gelderman has a superb biographer's style. Her approach is direct and cumulative; she builds narrative interest expertly and offers a wealth of meaningful detail. She wisely eschews competing with McCarthy's own forthright memoirs: the aforementioned *Catholic Girlhood* and the later "intellectual autobiography," *How I Grew* (which Gelderman dismisses as unworthy).

Perhaps overeager to show her subject's "gentle side," Gelderman fudges when confronted with McCarthy's vitriolic fictional representations of friends and colleagues ("she herself is aware that her portrayals can hurt, but it is not in her nature to write any other way"). Gelderman is curiously nonjudgmental about McCarthy's forays into and out of marriages and love affairs, and, I think, lavishes excessive praise on McCarthy's flawed novels—though it's good to have her intelligent, helpful reading of *The Groves of Academe* (1952), that amusing sendup of (Joseph) McCarthyism and academic politics.

On balance, her book abounds with fresh material and persuasive insights. It demonstrates the importance of such influential alliances as McCarthy's longtime friendship with political philosopher Hannah Arendt (surely a role-model female intellectual) and her virtual pupil-teacher relationship with an Italian expatriate journalist, Nicola Chiaromonte (whose "distrust of theory, anxiety about collectivization, and love of small communities" would crucially influence her own political thinking).

Gelderman makes us see the welter of impulses, as well as influences, out of which McCarthy's writings sprang, and makes us eager to strike up (or renew) acquaintance with this "strong, unsentimental, moral [and, I would add, often bracingly comic] voice that speaks for a just and ordered world."

Bruce Allen
Literary critic

Round Ireland in Low Gear
Eric Newby
Viking, $18.95

Driving a car in Ireland is not the easiest thing. True, a car takes you to places where you can admire the view, feel the springy earth beneath your feet and the rainy, peaty wind in your face. But Ireland also has some roads so narrow and precipitous that an onrushing car—the only kind the country has—would send any less boldly driven vehicle tumbling into the sea. On the theory that a bicycle provides all the views and earth and rainy wind you could want (with the added advantage of making a smaller target), intrepid British traveler Eric Newby and his faithful companion, Wanda, chose sturdy mountain bikes

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for the 1986 explorations recounted in *Round Ireland in Low Gear.*

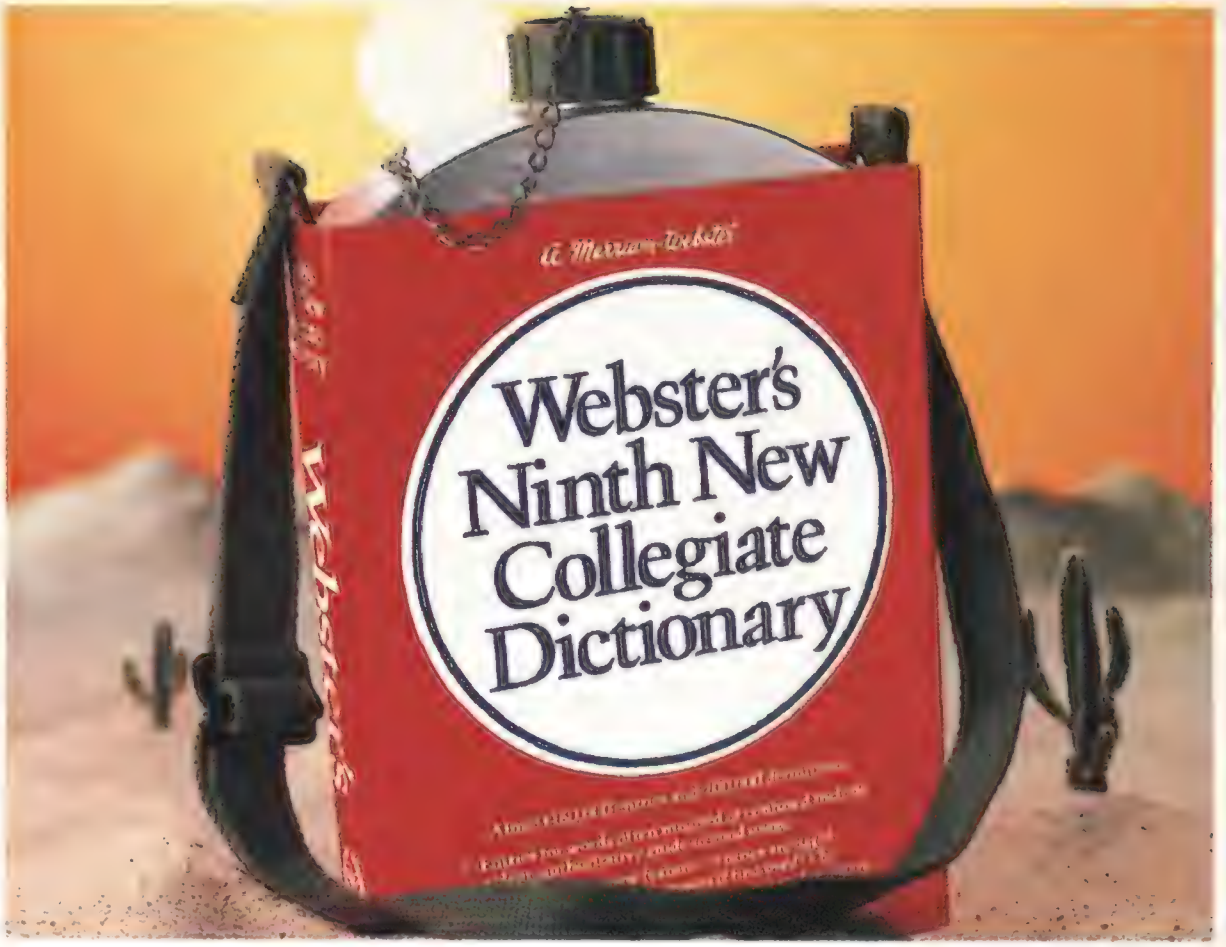
Newby has always been a stalwart and confident traveler, rising victorious over adversity in the Hindu Kush, the outermost reaches of Russia and the questionable waters of the Ganges. But Ireland—green, lovely, nearby, more or less English-speaking and generally mild mannered—nearly did him in. Although he never quite says as much, the trip was doubly misconceived. For obscure reasons, the Newbys decided to do the first leg of it, covering the southern region, in December and January, thereby subjecting themselves to the worst possible weather. There are more than a few pages here that grow eloquent on the subjects of rain, hail, sleet, snow, cold, wind and mud.

The second error was in choosing to travel on bicycles. Loaded with equipment, panniers, tools and spare parts, along with equally sturdy clothing and personal gear, the bikes quickly proved cumbersome and were often abandoned for buses, trains and hired vans. Age was not a problem, though Newby is nearing his 70th birthday, but maneuvering the overloaded bikes on muddy, windy roads "was much as I imagined it would be to ride a heavily loaded camel," Newby writes, "the principal difference being that you don't have to pedal a camel."

The innocent vagaries of Ireland and the Irish proved troublesome, too. For example, taking directions from any citizen in the countryside "usually means that you will never find what you are looking for and you yourself will probably never be seen again."

The problems proved a bit much for Newby, and for the book. The first 200 pages tell of cold and rain as the Newbys bid a fond farewell to town after town; the fondness in each case, however, is more for the farewell than for the town. Under such circumstances, they see less of everything. And learn less: "the disadvantage of riding bikes in the rain is that you can't consult guide books while awheel, and when you're not awheel you are too busy eating, drinking, squirting oil on your chain, changing your wet socks, sticking plaster on your bum, writing your notes or just slumping or sleeping to do much improving reading."

Later, when he returns to Ireland in June and again in October to explore the west and Donegal, the book turns



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brusque and ends rather abruptly. Despite many charming moments, and many funny ones, and despite a good store of anecdotes and odd characters, much of the author's thought is on sheer survival, the inconvenience of the bikes and the savage dog that bit his ankle.

Still, Newby is among the funniest and most engaging of contemporary travel writers, and even the adversities of this trip are colorfully reported. He is never dull on architecture, he is wary but willing on the subject of the moving statue of the Virgin at Ballinspittle, and he is amusing on the methods used by canal boatmen to draw off unauthorized Guinness from the casks they once transported. And although he is often impatient with the people he meets, he records them vividly. His book certainly doesn't warrant the damning label "improving," but it does offer some lessons: explore Ireland, of course, but if the thought of doing it by bicycle in winter occurs to you, call for another pint and drown the life out of such an idea once and for all.

Alan Ryan
Journalist and novelist

The Question of Hu
Jonathan D. Spence
Knopf, $18.95

The time is October 1725, the place a Catholic hospital for the insane, near Paris. A Chinese man dressed in tattered clothes, with his hair matted about his shoulders and his face bearing "the look of an exhumed corpse," is being questioned in the midst of a dozen robed clerics. At the end of the exhausting session, the gaunt little man, an inmate of the charity asylum for more than two years, is asked if he has any questions. "Yes," he replies. "Why have I been locked up?"

So it begins, this bizarre, true story of a bizarre man named Hu. Born in southern China, he is converted to Catholicism at age 19 and takes the name John at his baptism. A so-so scholar who can read and write his own language, he eventually becomes a catechist attached to the Church of the Sacred Congregation in Canton. The European priests use these catechists as translators and scribes, and also in a peculiar form of proselytizing: they scour the city streets at dawn to look for babies abandoned by desperate parents—babies who, if they live, can be raised as Christian children.

Forty years of age in 1721, Hu has become a fervent worker for the church and dreams of traveling to Rome to meet his new earthly father, the Pope. At about this time, a Jesuit priest named Jean-François Foucquet, after 22 years of missionary work in the Orient, is searching for a Chinese assistant to accompany him and his 11 crates of valuable Chinese texts on a voyage home to France. John Hu and Father Foucquet are introduced, and despite the aging priest's reservations (he finds Hu ugly, unclean and with a look of despair about him), a deal is struck. "It was either this Chinese or none at all," Foucquet was later to write.

According to the terms of the written contract, Hu will serve as the priest's copyist for five years, and he will be paid an annual salary as well as expenses for passage home when the time is up. The rough, unprepossessing Hu is ecstatic. He looks forward to the adventure of the ocean voyage, convinced he'll get to see the Pope and confident he will be able to write a book about his travels that will make him famous among his countrymen. The erudite Foucquet, who himself hopes to be made famous by his exegesis of his Chinese library, contradicts none of this.

If you suspected that in the alliance between ambitious priest and naive clerk there were sown the seeds of disaster, you were right.

Trouble begins even before the ship sails. Foucquet's superior, Father Pierre de Goville, has qualms about the whole idea and tries to prevent Hu's departure.

Foucquet, however, outsmarts him and they're off to France.

The Chinese-speaking Hu and the French seamen don't get on well. Worse, Hu is seasick for much of the voyage.

Soon after arriving in France it becomes apparent that the poor man is unsettled, he gives away his fine, warm tunic and wants to beg. Violence alternates with periods of calm. He dreams that his mother has died and becomes despondent. He disappears and reappears, makes himself a crude flag and drum and marches around Paris.

His ranting at St. Paul's Church attracts crowds who cannot understand but applaud anyway. All very embarrassing.

Distraught, Foucquet goes on to Rome, abandoning Hu to friends who take him to the Brothers of Charity at Charenton.

The end of our offbeat little history is not so tragic as it is disturbing. Before he is eventually returned to his homeland, John Hu has had to stand in a madhouse door and ask the question, Why have I been locked up? Why indeed? Was it, as the disapproving Goville later suggested, Foucquet's selfish insensitivity? (Foucquet's lengthy defense and documentation of his own behavior suggest he may have had some worries on this point.) Was it a matter of cruelty and neglect by a powerful church, however unintentional, or was it, all along, a question of Hu?

As each century goes by, the past recedes ever more swiftly into shadow. It is historians such as Jonathan Spence, George B. Adams Professor of History at Yale, who keep the encroaching darkness at bay with their colorful resurrection of character and event. In addition, Spence tells this remarkable story in the present tense, making the action appear to unfold before our very eyes.

William Dieter
Denver novelist

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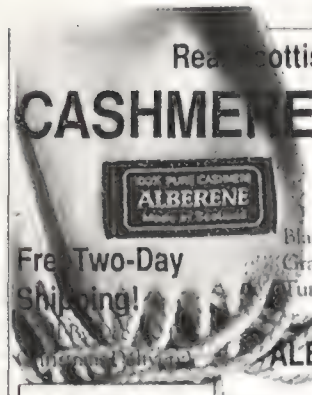

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Holiday cheer at American History
The annual festival of music, dramatic presentations, and demonstrations of crafts and cooking to celebrate Christmas, Hanukkah and the New Year takes place December 26-31, 12 noon-4 P.M., at the Museum of American History. Admission is free. For more information, call 357-2700.

Special December exhibits and events

National Museum of African Art
Kalabari Ancestral Screens: Levels of Meaning and *Echoes of the Kalabari* (through January 29) See *Highlights continued*, page 220.
Royal Benin Art Objects created by guilds of court artisans from the 15th through 19th centuries.
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National Museum of American Art
Perpetual Motif: The Art of Man Ray (December 2-February 20) Major retrospective on one of the founding fathers of modernism (see page 60).

Arthur M. Sackler Gallery
A Jeweler's Eye: Arts of the Islamic Book from the Vever Collection (through April 30) Paintings and manuscripts from the Parisian jeweler's trove.
Japanese Art: Recent Acquisitions A spectacular ceremonial palanquin and a pair of six-panel folding screens.
Stories from China (December 3 and 17; 9:30 A.M. and 5:30 P.M.) Children's storyteller Linda Fang. Reservations necessary; call 357-4886.

Hirshhorn Museum & Sculpture Garden
Gerhard Richter (December 14-February 12) Paintings, objects, photographs by the contemporary German artist.
Directions: Walter Pichler (through January 22) The Austrian artist's fantastical drawings.
Krzysztof Wodiczko: Works (through January 22) Videotapes by the Polish-born artist.

National Museum of American History
Trees of Christmas (through January) Eleven spruce and fir trees decorated with handcrafted ornaments.
Sports Feelings (through February 5) First joint exhibition of American and Soviet sports photography.
The American Presidency, 1789-1989 (through June) More than 400 objects and photographs.
Commemorating New Sweden (through January 31) A 350th anniversary look at the first Swedish settlers and their Algonquin neighbors.
There's No Business Like Show Business: Irving Berlin's Centennial (through January 31) Homage to the composer.

National Portrait Gallery
On the Air: Pioneers of American Broadcasting (through January 2) The golden age of radio and television.

National Museum of Natural History
Crossroads of Continents: Cultures of Siberia and Alaska (through April 2) First jointly curated Soviet-North American exhibit ever: traditional cultures seen through 500 artifacts.
"Coyote": A Myth in the Making (December 21-March 21) Ten-year retrospective of the works of American Indian artist Henry Fonseca.

S. Dillon Ripley Center
Threadworks: Miniature Textile Art (through January 8) Creations by 19 American artists (SITES Gallery).
Tropical Rainforests: A Disappearing Treasure (through January 2) Floor-to-ceiling film screens, photographs, models (International Gallery).

National Air and Space Museum
European Space Agency (through January) Overview of recent missions.
Focus on Flight (through April) Forty prizewinning photographs from the NASM-sponsored contest.
Countdown (December 14; 7:30 P.M.) Apollo 8 astronaut Frank Borman discusses his newly published book.

Cooper-Hewitt Museum (New York)
Purses, Pockets, Pouches (December 6-March 5) Textile offerings, 17th to 20th centuries.
Courts and Colonies: The William and Mary Style (through February 12) Dutch, English, American decorative arts in observation of the 300th anniversary of their accession to British throne.
Erich Mendelsohn: 1887-1953 (through January 8) Drawings encompassing the career of a major architect.

Renwick Gallery
Stephen de Staebler: The Figure (through February 12) Thirty-five clay and bronze life-size sculptures.

Exhibition catalogs

Catalogs available currently include:
Perpetual Motif: The Art of Man Ray (paper, $25.95; cloth, $55)
Gerhard Richter: Paintings (paper, $24.95)
Alberto Giacometti (paper, $24.95; cloth, $50)
Crossroads of Continents: Cultures of Siberia and Alaska (paper, $24.95; cloth, $45)

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Resident Associate Program

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Once Upon a Christmas: A Musical Review (December 18; 4:30 P.M.) An old-fashioned celebration.
Journey to the Center of the Earth (December 6; 8 P.M.) Geophysicist John Woodhouse's illustrated lecture on exciting advances in seismic tomography.
Union Station: An Historical Treasure (December 12; 8 P.M.) Railroad historian John Hankey's salute to the renovation.

Smithsonian Institution Traveling Exhibition Service

SITES organizes and circulates exhibitions to cities throughout the United States and abroad. To sponsor a show in your community, write SITES, Smithsonian, Washington, D.C. 20560. Here are some December exhibits:
Anchorage, Alaska (December 3-January 1) *A Collector's Eye: The Olga Hirshhorn Collection*, Anchorage History and Fine Arts Museum.
Jacksonville, Florida (December 24-January 22) *Beauties of the Coral Reef*, Florida Community College.
Kansas City, Missouri (December 3-January 8) *The Santa Fe Trail: Photographs by Joan Myers*, Nelson-Atkins Museum of Art.
Portland, Oregon (December 17-January 29) *Tracks in the Sky: Wildlife and Wetlands of the Pacific Flyway*, Oregon Historical Society.
Portsmouth, Ohio (December 3-January 1) *Victorian Gardens: A Horticultural Extravaganza*, Southern Ohio Museum and Cultural Center.
Springfield, Illinois (December 21-February 20) *The Long Road Up the Hill: Blacks in the United States Congress, 1870-1983*, Cilco Building.

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Highlights continued

From Nigeria, past and present: Kalabari visions

"Kalabari festivals celebrate mythological characters and water spirits and historical characters," says sculptor Sokari Douglas Camp. "These figures come to perform for you and tell you stories about their world." Working in London, Camp has drawn on the rituals of her Nigerian culture—masquerades, festivals, funeral celebrations—to construct life-size pieces that call up the magical exuberance of those spectacles.

All of Camp's creations reflect the artistic legacy of the Niger delta region. Her Kalabari forebears, as overseers of trading houses that controlled commerce between Europeans and the African interior from the 17th to 19th centuries, fashioned objects reflecting their powerful positions. In particular, Kalabari artisans produced *duein fubara*, ornate bamboo-and-wood screens made to commemorate important ancestors.

Two new shows at the National Museum of African Art, Camp's "Echoes of the Kalabari" and "Kalabari Ancestral Screens," examine this distinctive, enduring culture from contemporary and traditional vantage points. The screens, brought together from museums in England and Scotland, represent a unique remnant of those destroyed or lost early in the 20th century.

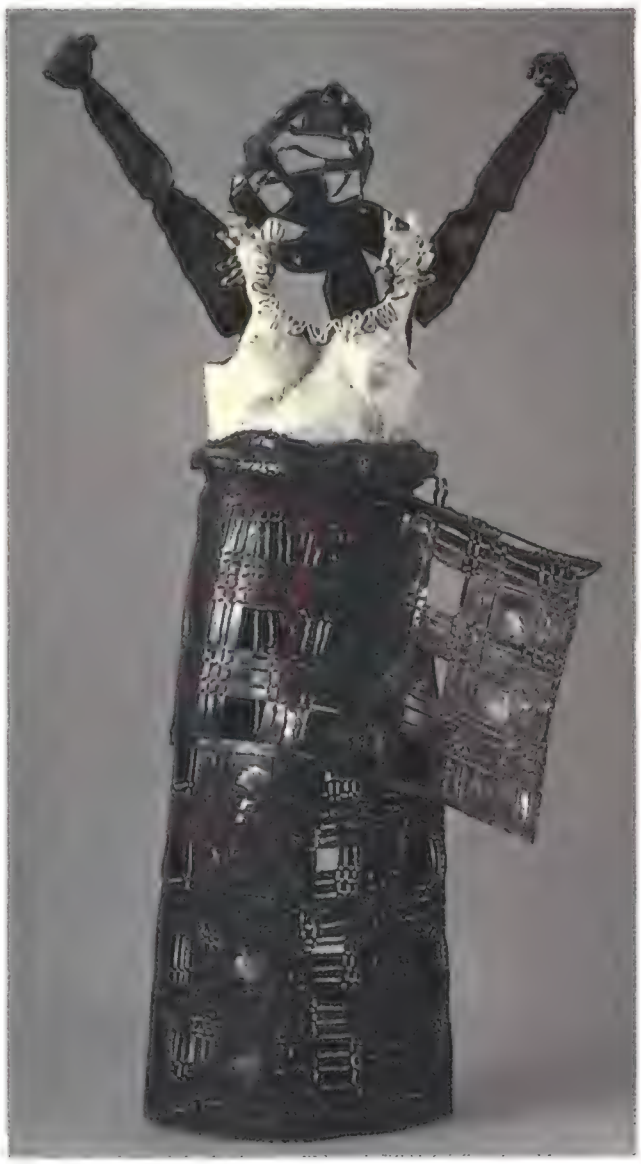
The juxtaposing of the exhibits, according to Camp, is a remarkable event in itself. "Being shown with the screens," she says, "is a fantastic thing. In Nigeria, I am not even allowed to look at them. The first time I was able to have a really close look was at the British Museum. I was terrified because they are taboo."

Fourteen of Camp's steel-and-wood pieces—figures that clap and sing out with true Kalabari vitality—and 11 screens remain at the NMAfA through January 29, 1989.

Kathleen M. Burke

Ancestral screen of Barboy trading house incorporates European vessel in imagery.

Welded-steel *Iriabo (Woman) and Child* depicts characteristic festival observers.



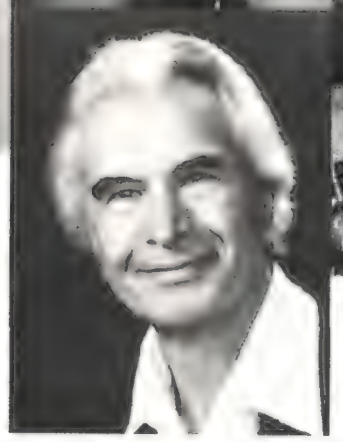
An exultant figure's patterned wrapper is inspired by Kalabari woven textiles.

Masquerader with Feather Headdress recalls richly costumed festival dancers

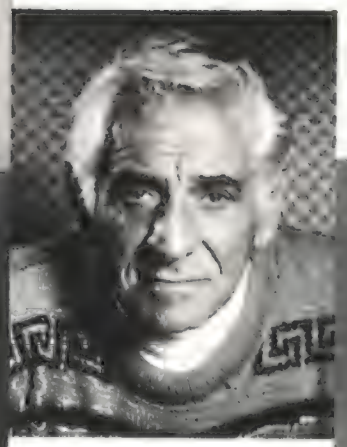
Joe Williams

Liza Minnelli

Glenn Close



Dave Brubeck



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Domestic Study Tours

NEW Christmas in Asheville December 23-26: Celebrate the holiday at North Carolina's historic Grove Park Inn; includes candlelight tour of majestic Biltmore Estate.

Hawaii January 22-February 3 or February 12-24: Explore the diversity of four islands on this active nature tour.

Florida Springs January 28-February 1: Canoe in central Florida and see the endangered West Indian manatee.

Death Valley March 7-16 or 20-29: Venture into the mountains and canyons of the Mojave Desert area on foot and by van.

Big Bend March 22-31: Hike in this wild and scenic park; also visit Carlsbad Caverns and McDonald Observatory.

Sojourn in Tucson April 1-8 or 15-22: Local experts provide an overview of the area's multiethnic folklore and natural history.

NEW Savannah-Charleston April 2-9: Learn about historic homes and gardens in these graceful Southern cities.

NEW Renaissance Miami April 5-10: Enjoy the city's culture and design. Stay in Coral Gables at the elegant Biltmore, recently restored to its "boom years" splendor.

Delta Queen April 6-14: Take a steamboat journey into America's past on the lower Mississippi from New Orleans to Memphis.

Okefenokee May 2-7: For novice or expert canoeists; discover the beauty of this wildlife refuge near Jacksonville, Florida.

Southwest Indians May 5-14: During this in-depth look, travel to Phoenix, Chaco Canyon and Canyon de Chelly. Meet craftsmen; visit museums and private collections.

Spring Gardens May 7-14: Study historic gardens in Washington, D.C. and the Delaware Valley.

NEW Brooklyn with a Bang May 25-28 or September 14-17: Brownstones, the Botanic Garden, the Brooklyn Bridge and a booming new art scene.

Foreign Study Tours

People's Republic of China A variety of tours in 1989 for new and repeat travelers.

Smithsonian Christmas Enjoy the holidays on Fiji, in the warm climate of New Zealand, or in one of four idyllic European settings including England (Winchester or Canterbury), Austria and Switzerland.

Antarctica and Falkland Islands December 27-January 12: Aboard the M.V. *Society Explorer*, thrill to spectacular scenery, visit research stations, photograph wildlife.

Mesoamerican Study Programs January and February: Yucatán, El Tajin or Guatemala.

Backstage London January 3-12: Attend five top theatrical productions, meet performers backstage.

South America Voyage January 6-30: Cruise from Rio to Santiago through the Strait of Magellan, Beagle Channel *and* around Cape Horn. Includes Iguaçú Falls.

India Wildlife Safari January 22-February 18: Travel by elephant and jeep to observe rare species of birds and animals.

Kenya-Tanzania Wildlife Safari January 26-February 12: Unique journey to East Africa.

NEW Leningrad Arts Seminar January 27-February 8: Overview of art, architecture and history; visits to the Hermitage and the Russian Museum. Pretour program in Washington features Hillwood's collection.

NEW Paris in Winter February 7-18: Experience art, theater, commerce, cuisine and more, in the quiet of the off-season.

NEW Jamaica February 26-March 8: Study the customs and culture of this delightful West Indian island.

NEW Budapest Music Festival March 15-26: International performers gather to celebrate musical traditions.

NEW Sea of Cortez March 19-29: Cruise Mexico's Gulf of California. See blue whales and other wildlife. Disembark at Manzanillo, near famous Las Hadas resort.

Costa Rica March 25-April 8: Learn about flora, birds and other wildlife in the American tropics.

Kyoto Seminar March 25-April 9: Reside in a traditional Japanese ryokan. Explore history and culture.

Berlin April 13-28: An intimate look at fabulous Berlin, East and West. Includes travel to Dresden, Wittenberg and Weimar.

Danube Voyage May 23-June 9: Cruise from Rumania to West Germany aboard the *Theodor Körner*. Study the art and history of countries linked by this major waterway.

NEW Cotswold Walks May 25-June 6: Get acquainted with the English countryside—woods, farms, glorious pastures and picture-book villages.

Cities of Central Asia May 27-June 8: Begin in Leningrad, then fly to Samarkand and Bukhara. Ends in Moscow.

Florence Seminar May 27-June 11: Live in an elegant villa-hotel. Enjoy excursions; study the Renaissance.

Greece May 29-June 12: Marvel at classical wonders and beautiful landscapes from Athens to Thessaloniki.

Wild Highlands of Scotland June 2-18: Reside at Aigas Home and Field Centre. Enjoy spectacular scenery while learning about the cultural and natural history of the Highlands.

Turkey's Eastern Reaches June 7-24: Travel east from Ankara and rediscover the ancient Orient, land of the Hurrians, Hittites, Georgians and early Turkic tribes.

Poland June 9-25: Explore a rich cultural heritage in Warsaw, Kraków and other colorful cities.

British Isles Voyage June 16-July 3: Aboard the *Argonaut*, circumnavigate Britain to explore ancient ruins, great houses and remote hamlets.

Cave Art in France and Spain June 19-July 4: Visit the Cantabrian and Basque coastlines, the foothills of the Pyrenees and the valley of the Dordogne.

Lena River—USSR July 26-August 17: Cruise a Siberian wilderness waterway on an exclusive charter boat. Includes Moscow and Leningrad.

Write Smithsonian National Associates, 1100 Jefferson Drive SW, Washington, DC 20560 or call (202) 357-4700 for tour brochures

Washington

Smithsonian Seminars

Washington, D.C. January 11-14
Join your fellow Associates in seminars designed to meet your special interests.

New Perspectives on the Impressionists
Gain new insights into the work of Manet, Morisot, Gauguin, Degas and others during lectures and tours.

Where's the Melody?
American Jazz Favorites
Listen to masterpieces by Jelly Roll Morton, Louis Armstrong, Duke Ellington and more during music-accompanied lectures by renowned jazz scholar Martin Williams.

The Homestead
Hot Springs, Virginia, January 23-27
Enjoy a winter break at the famed resort in the beautiful Allegheny Mountains of western Virginia.

The Art and Craft of Creative Writing
Study the fine points with Edwards Park, author of SMITHSONIAN's monthly column *Around the Mall and beyond.*

American Popular Song
Relive America's golden age of song with acclaimed jazz pianist John Eaton, who discusses and performs the works of Gershwin, Porter and Berlin.

The Broadmoor
Colorado Springs, Colorado
February 22-25
Spend four exhilarating days at this landmark resort in the rolling foothills of the Rocky Mountains.

Highlights of Aviation History
Trace major developments in civil and military aviation with curators from the National Air and Space Museum. Tour the U.S. Air Force Academy and NORAD headquarters.

American Popular Song
Jazz pianist John Eaton repeats his course for Associates (see listing above).

Coming Up: The Smithsonian returns to Mohonk Mountain House near New Paltz, New York, April 2-7. Smithsonian Research Expeditions inaugurates its 1989 season with participation in projects including the National Museum of American Art's sculpture inventory, a documentation of Washington, D.C. war memorials, archaeological fieldwork at a 17th-century Florida mission, and archival research in London's libraries and museums. Watch this column for details.

or (202) 357-1350 for seminar brochures.

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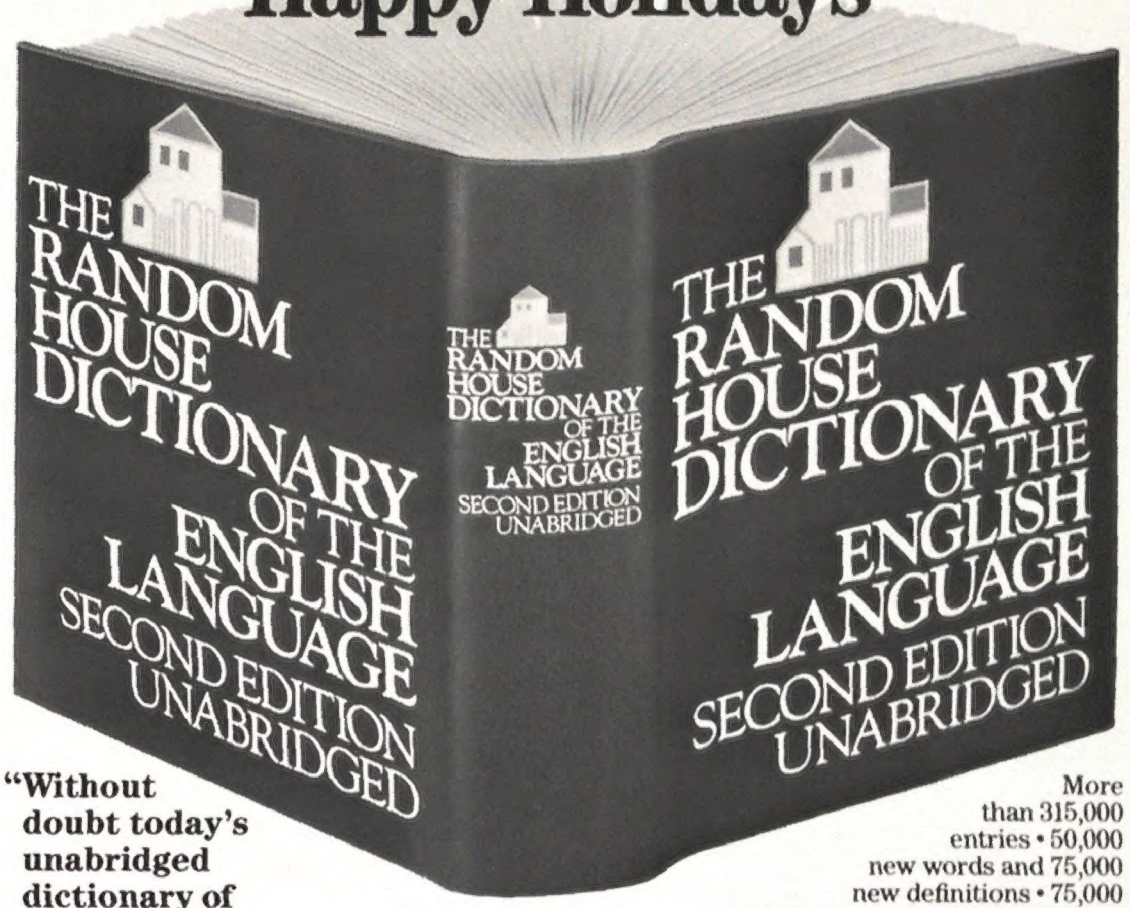
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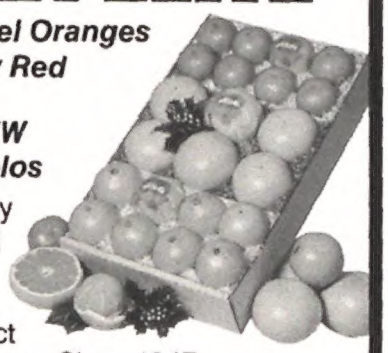

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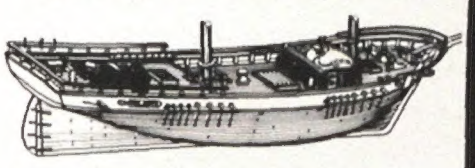

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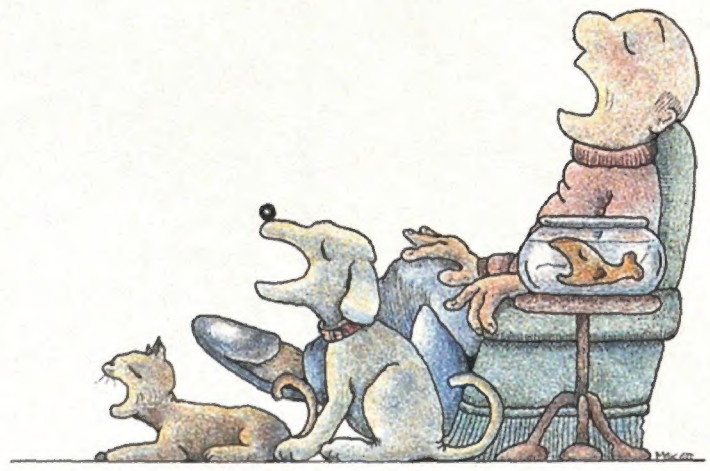
By Israel Shenker

'One who yawns invites another to follow suit'



Until I faced up to it, I thought yawning was an open-and-shut case. Then I discovered that science and medicine have been treating it as a big deal, with theory, experiment and all-around confusion.

It seems—nobody's sure of anything nowadays—that yawning was once seen as a chance for evil spirits to enter the body while the soul slipped out. So we began covering the mouth to frustrate the to-and-fro, but that hasn't put a lid on certain vital questions. Such as:

QUESTION 1. Who yawns? Science replies: fish yawn on switching from one activity to another. Chickens stand on tiptoe, flap their wings—and yawn. Dancing birds induce come-hither yawns in lady friends of the species. The male herring gull yawns when the female shows a red spot on her mandible. With its head out of the sand, the South African ostrich has been caught yawning. Dogs yawn like mad when they become aggressive, unless—and this goes for cats and apes, too—they're signaling peaceful coexistence. (This is science hedging its bets.) Carnivores and primates yawn; herbivores don't. Explanation: herbivores never breathe through the mouth.

All perfectly straightforward, even if the Germans will make a problem of it, as witness a scientific paper published in 1975 by the eminent V. F. Luttenberger, entitled "Zum Problem des Gähnens bei Reptilien." The word *gähnen* is German for "to yawn." *Ja*, reptiles yawn.

QUESTION 2. What do we do about it? Answer: shoot back in Latin, or as the no-less-eminent 17th-century physician Daniel Sennert noted: "*Cum enim qui videt alium oscitare, ipse quoque ad oscitandum invitatur*," or "One who yawns invites another to follow suit."

Another thing you do about yawning is resort to experiment. Enter psychologist Robert R. Provine of the University of Maryland and 37 volunteers from his introductory psychology class. Students who agreed to yawn for science were promised extra class credit. Freshmen, to say nothing of sophomores, juniors and seniors, like nothing better than a snap course and this promised to be one. "It is important that you relax and do not force yawns," the experimenter reassured them. "Most people can yawn by simply thinking of it."

In solitary confinement, they had to push a button when each yawn began and keep pushing it until it ended. Next they experimented with clenched-teeth yawning—less satisfying and not always easy to do. Then they watched two videotapes, one of an actor yawning, another with him smiling, to see whether yawns do indeed stimulate yawning, just as old Sennert said. Finally, one group read a text about yawning, while a control group read about hiccuping. Result: the yawning text induced more yawning. Provine calculated the average student yawn at 5.9 seconds, with an "interyawn" interval of 68.3 seconds.

Hic transit gloria, which takes nothing away from the luster attaching to Dr. Jacques Barbizet of St. Antoine Hospital in Paris, who studied yawning with radiographs every half-second. He detected dilation of pharynx, larynx, nostrils and bronchial tubes; lifting of the eyebrows; lowering of the diaphragm; retreat of the tongue; a slight racing of the heart; increased flow of blood to the brain; rhythmic lateral motions of the mandible; closure of the eyes; occasional tears and saliva; as well as (now and then) dislocation of a jaw. That didn't leave much unaccounted for except the islets of Langerhans, but Barbizet's study went on to assert that hunger stimulated yawning and—hedging bets again—so did a contented tummy. In France, the study also revealed, gourmands of florid complexion sometimes seek medical advice for postprandial yawns. Finally—*toujours la politesse*—Dr. Barbizet warned that yawns are taken as signs of fatigue or boredom, and "a stifled yawn does not escape a careful observer."

Trying to attract the attention of a waitress in the pump house at Baden-Baden, careful observer Mark Twain ungallantly reported seeing a "yawn of such comprehensiveness that the bulk of her face disappears behind her upper lip, and one is able to see how she is constructed inside."

When Vice President Alben Barkley, a loose constructionist, presided over the Senate, the majority leader (R.) yawned and another senator (D.)—who was droning on—apologized for almost putting him to sleep. Barkley expunged the yawn from the *Congressional Record*. Expunging the yawn from the majority of yawners is infinitely more difficult, since yawns crave fulfillment.

QUESTION 3. What was your average interyawn interval while reading this learned essay? Anything less than 68.3 seconds entitles you to full term credit.

QUESTION 4. Where do we go from here? Nodding off, Dr. Barbizet wrote of "gaps open to further research."

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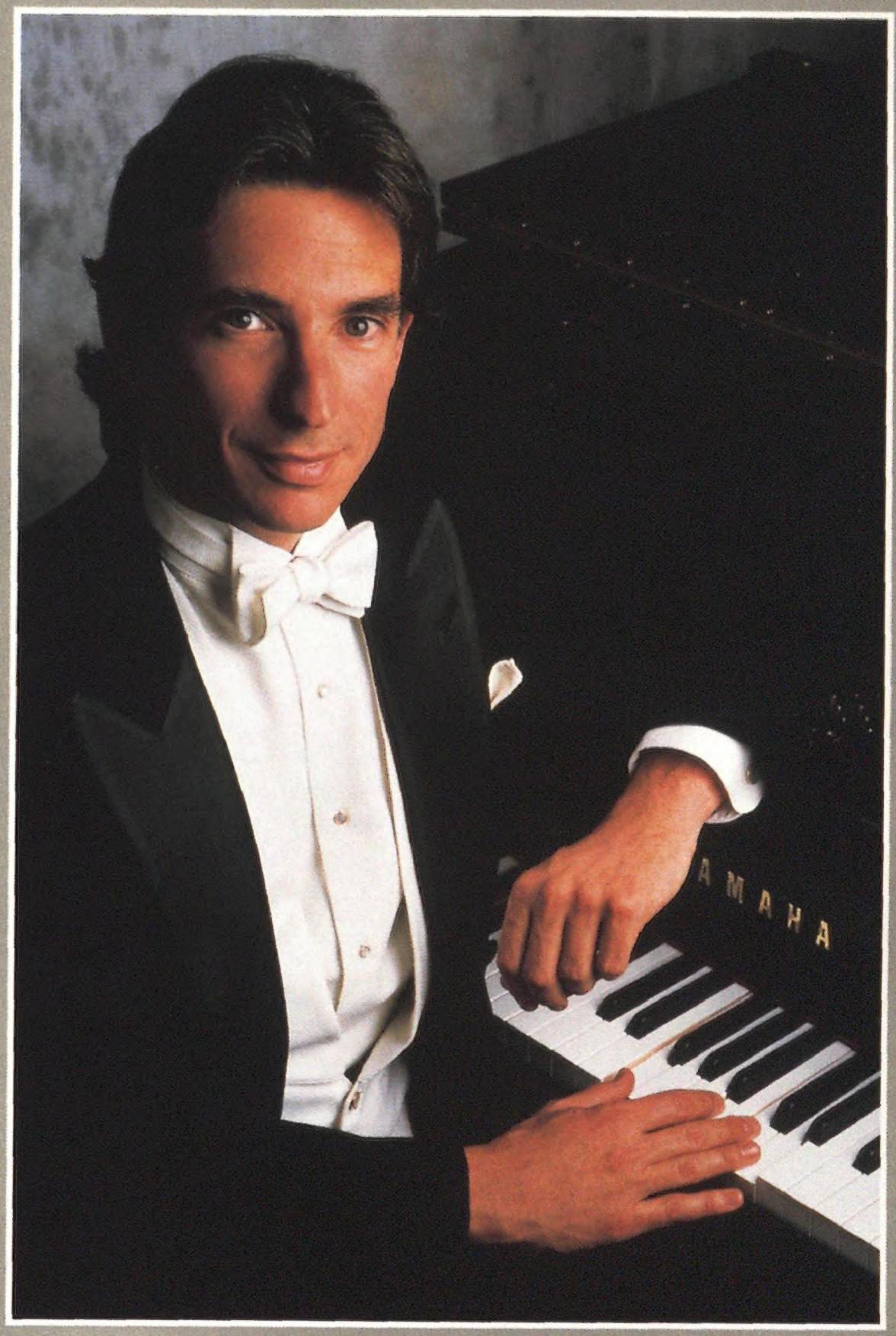

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